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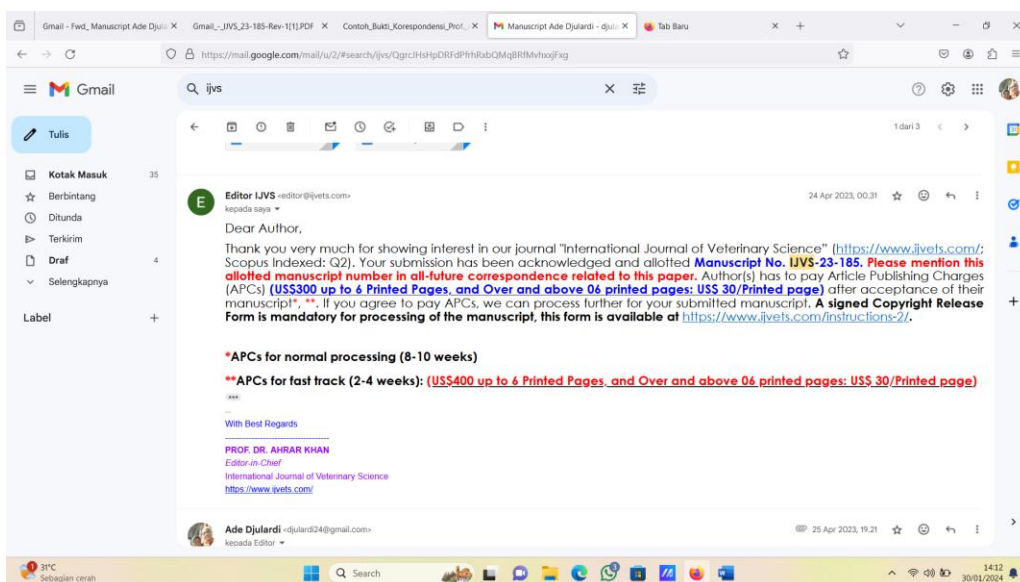
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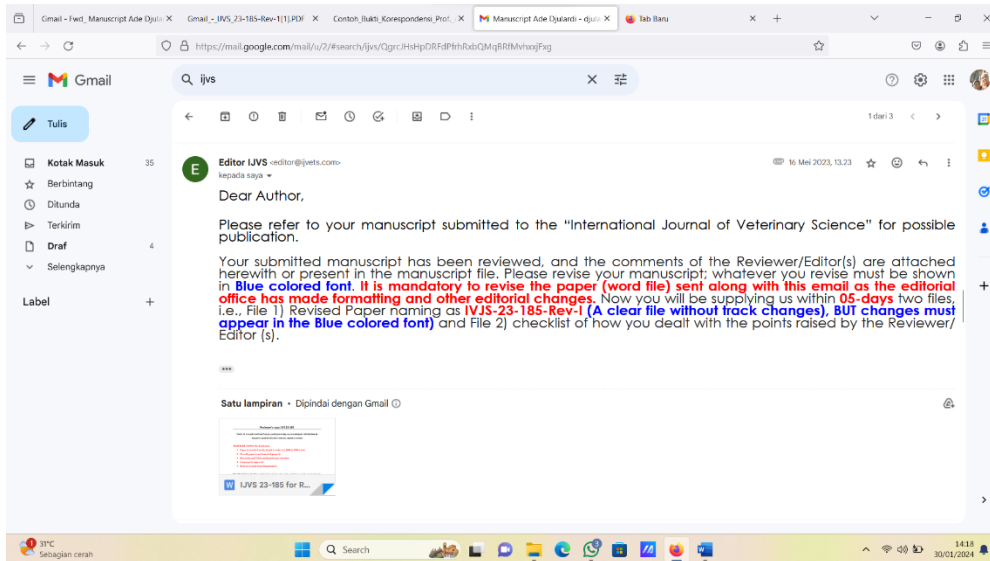
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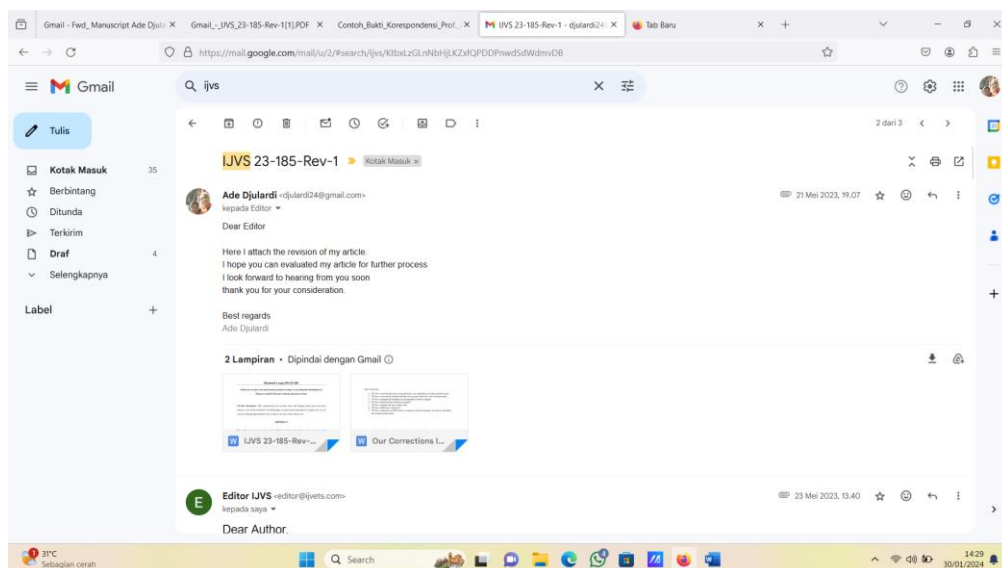
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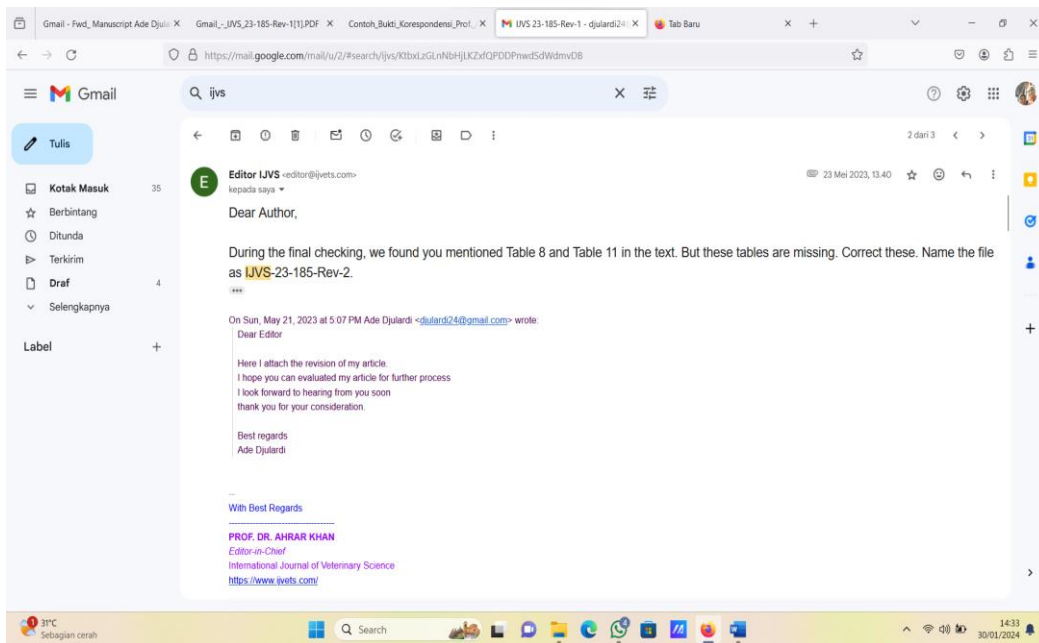
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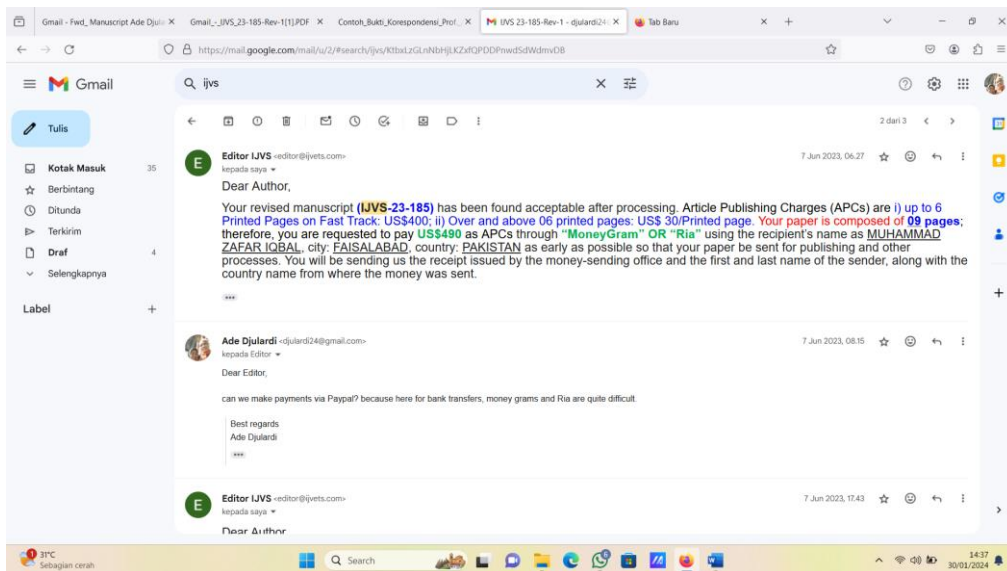
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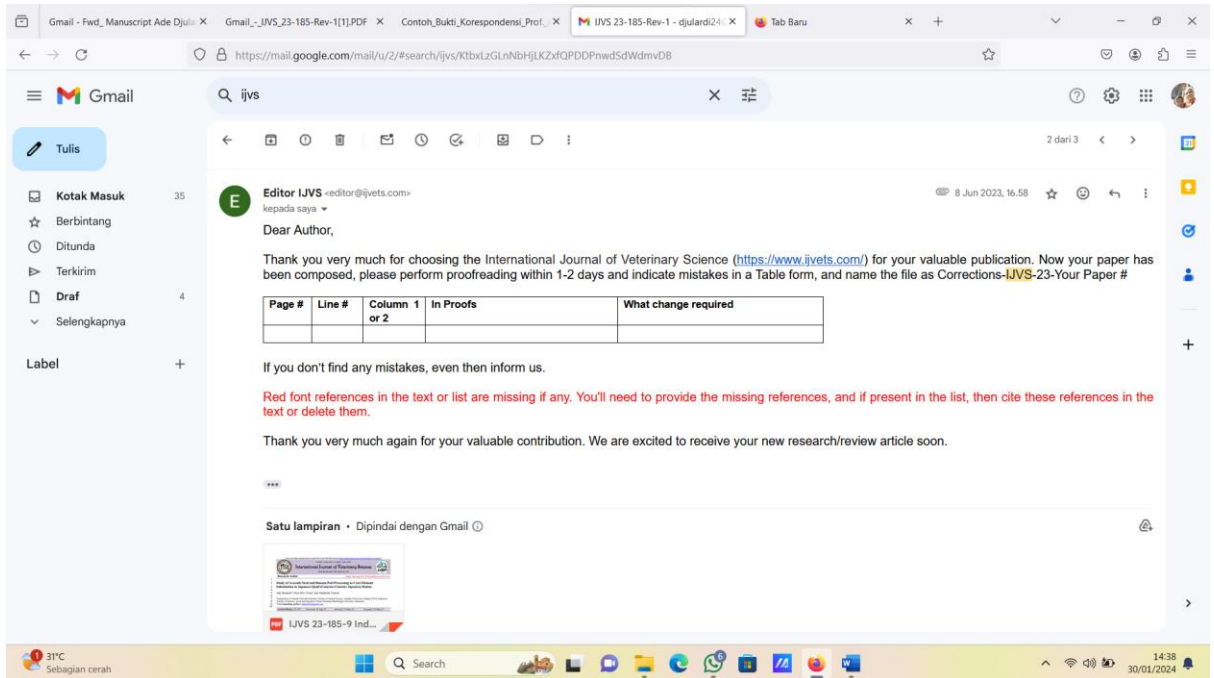


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1 **LAMPIRAN A**

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4 **Study of avocado seed and banana peel processing as corn element substitution in**
5 **Japanese quail (*Coturnix-coturnix japonica*) ration**

6

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13 *Novelty Statement: The combination of avocado seeds and banana peels processed into rations*
14 *is one of the alternative breakthroughs in quail ration ingredients to replace the use of corn by*
15 *utilizing agricultural waste so that it can also reduce feed costs.*

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29 **ABSTRACT**

30 This study aims to use avocado seeds and banana peels processed into rations to replace the
31 use of corn by utilizing agricultural waste so that it can also reduce feed costs. This research
32 consists of 3 stages of experiments, namely, experiment 1: processing avocado seed flour and
33 banana peel flour to improve its quality. Experiment 2: the results of stage 1 research were
34 carried out direct biological tests to livestock to see digestibility, stage 3 research: application
35 of avocado seed and banana peel-based rations to quail. The results showed that Avocado Seed
36 Processing (ASP) through soaking with 30% Husk Ash Water Filtrate (HAWF) for 48 hours
37 can reduce tannin content in seeds by 42.86%, but crude protein content decreased by 37.53%
38 and increased nitrogen retention by 57.62%. Fermentation of Banana Peel (FBP) using EM4 at
39 a dose of 15 ml/100 g and fermentation duration of 6 days can reduce 15.54% of crude fiber
40 content and increase crude protein content by 31.12% and increase crude fiber digestibility by
41 380%. It was concluded that the ration that gave the best response on performance and egg
42 quality was ration C (20% FBP) and F (5% ASP + 15% FBP) so that it could reduce the use of
43 corn by 44%.

44 **Key words:** quail, avocado seed, banana peel

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INTRODUCTION

58 The poultry sector is one of the livestock sectors that plays an important role in meeting
59 animal protein needs, both poultry as egg producers and as meat producers. The short
60 maintenance time of poultry to produce meat and egg production is one of the reasons poultry
61 farming has the potential to be developed. In addition, the price of protein sources from poultry
62 consisting of meat and eggs is also cheaper and affordable by the purchasing power of the
63 Indonesian people in general, this causes the demand for eggs and poultry meat to increase.

64 Quail is one of the various types of poultry livestock that is good to continue to be
65 developed because quail is known as a good egg producer and fast sex maturity. Quail have
66 high egg production, reaching 200 to 300 eggs per bird per year with simpler maintenance
67 management (Thomas et al. 2020). In addition, quail growth is faster and relatively does not
68 require a large area for maintenance, so quail is one of the livestock that can provide a source
69 of animal protein, especially quail eggs, for the community at a relatively low price.

70 In quail farming, farmers are always faced with the problem of increasing feed prices
71 because some feed ingredients are still imported and the availability of feed is limited, while
72 this feed factor is an important factor in the success of quail farming because 60% to 70% of
73 the costs in raising quail include feed costs (Redoy et al. 2017). This encourages farmers to
74 look for alternative feed ingredients or unconventional feed ingredients that are waste or by-
75 products of agriculture or other fields. One of the wastes that can be utilized is avocado seeds
76 and banana peels which can be used as one of the energy source feed ingredients.

77 Avocado seeds and banana peels have the potential to be used as energy source feed.
78 According to BPS (2018), West Sumatra Province in 2010 produced 29,457 tons of avocado
79 fruit, while banana fruit was 160,516 tons so that the avocado seeds produced were
80 approximately 7,364 tons and 48,154 tons of banana peels, this is because the weight of
81 avocado seeds is 25% of avocado fruit and many banana peels are 30% of banana fruit.

82 Avocado seeds in poultry can reduce the use of corn and bran. According to Safrida et
83 al. (2021) the metabolic energy content of avocado seeds (EM = 3570 Kcal) is higher than that
84 of corn (EM = 3400 Kcal), while the protein content of avocado seeds (10.4%) is also higher
85 than the protein content in corn (8.5%). However, the use of avocado seeds as feed ingredients
86 in quail rations cannot be directly because avocado seeds contain quite high tannins, which are
87 around 1.47% and while poultry can only tolerate tannins 0.5% (Choi et al. 2020), so to reduce
88 tannin levels in avocado seeds, processing is carried out first such as soaking with water or
89 alkaline solutions.

90 According to Dahyuni (2004) tannin levels in avocado seeds can be reduced through
91 soaking with alkaline solutions such as NaOH. NaOH will bind tannins consisting of
92 polyphenol bonds so that when washing tannins that have been bound by NaOH will be wasted
93 with water. The husk ash substrate can be used as a cheap and easily available NaOH
94 replacement alkaline solution, this is in accordance with the opinion of Jamarun et al. (2021)
95 which explains that husk ash water functions as a base that is cheap and easily obtained in rural
96 areas, it can be used as a substitute for NaOH, Furthermore, Sari et al. (2022) also explained
97 that hydrolysis with husk ash water is more profitable than other types of alkali. The use of
98 processed avocado seeds with NaOH up to 20% does not interfere with quail performance,
99 while above 20% causes quail performance to decline (Dahyuni 2004).

100 In addition to avocado seeds, another waste that can also be utilized as poultry feed is
101 banana peels. In terms of composition, banana peels have a gross energy content of 4363
102 Kcal/Kg and crude protein of 8.36% and a very high vitamin A content, especially provitamin
103 A, namely beta-carotene, of 45 mg per 100 grams dry weight (Nurkholis 2005). Beta-carotene
104 acts as an antioxidant. In addition, banana peel also contains carbohydrates, especially extracts
105 without nitrogen at 66.20% (Ziaul and Muneera 2022), so it can be used as an energy source
106 feed ingredient to replace some corn or bran in the ration.

107 The utilization of banana peels in quail rations cannot be maximized due to its high
108 crude fiber content of 15% (Ryan et al. 2011), so to reduce the crude fiber content and increase
109 the nutritional value of banana peels can be done by fermentation. Fermentation with EM 4 can
110 reduce the crude fiber content of feed ingredients. The results of research by Mirzah et al.
111 (2007) stated that fermentation of shrimp waste with EM4 at a dose of 20ml/100 g substrate
112 fermented for 11 days produced good nutritional value in shrimp waste and among others could
113 reduce crude fiber content.

114 Santoso et al. (2008) research showed that EM4 is very effective in reducing crude fiber
115 of cassava leaves from 29.74% to 22.04%, EM4 is thought to produce a large amount of crude
116 fiber digesting enzymes such as cellulose and mannase (Rostika et al. 2017). The advantage of
117 *Lactobacillus* in EM4 in digesting crude fiber is because the bacteria do not produce crude fiber
118 in their activity, and so they are more effective in reducing crude fiber. The use of banana peels
119 up to 20% does not affect the growth of broilers, if it reduces body weight (Ziaul and Muneera
120 2022).

121 The use of avocado seed waste soaked with husk ash water filtrate and banana peel
122 fermented with EM4 in the ration of laying quail can be used as an energy source feed

123 ingredient to reduce the use of corn so as to reduce feed costs which will ultimately increase
124 profits.

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MATERIALS AND METHODS

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147 **Ethical approval**

148 The present study was approved by the Animal Ethics Committee of Andalas
149 University, West Sumatera, Indonesia.

150

151 **Experimental site**

152 **Trial 1: Preparation of Processed Avocado Seed Flour (ASP) and Fermented Banana
153 Peel Flour (FBP)**

154

155 **Tannin reduction of avocado seed with husk ash filtrate**

156 The processing process for avocado seeds is by thinly slicing then soaking with: water
157 (A1), soaking with 10% husk ash filtrate (A2), soaking with 20% husk ash filtrate (A3) and
158 soaking with 30% husk ash filtrate (A4), each for 48 hours. After the avocado seeds were
159 soaked, they were dried in the hot sun. After drying, the avocado seeds are ground and made
160 into Processed Avocado Seed Flour (ASP).

161 Avocado seed processed samples were tested for tannin content using the hide powder
162 method and crude protein content using the AOAC (2005) method.

163

164 **Fermentation of Banana Peel (FBP)**

165 The washed banana peels were cut into small pieces and then subjected to 3 treatments,
166 namely fermentation with EM4 with doses: 0 ml, 15 ml and 30 ml per 100g of material with
167 fermentation duration of 0, 6 and 12 days. This treatment aims to reduce the crude fiber content
168 and improve the nutritional quality of the banana peel. After the banana peels were fermented,
169 they were dried in the sun to make Banana Peel Flour. To see the effect of fermentation, crude
170 fiber and crude protein were tested according to AOAC (2005) procedure.

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174 **Trial 2: Biological tests (nitrogen retention of ASP and crude fiber digestibility of FBP)**

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176 Trial 2 included biological tests on the best trial 1 treatments consisting of N retention
177 for avocado seed and crude fiber digestibility for banana peel. Then the best results of the
178 treatment of Avocado Seed Flour (ASP) and Banana Peel Flour (FBP) were also determined
179 for metabolic energy content. Furthermore, laboratory tests were carried out in the form of
180 proximate tests of the best ASP and FBP which aimed to determine how much nutritional
181 content (water content, crude fat, Ca and P) would be used for ration formulation in trial 3.

182 The materials used were: the best ASP and FBP samples in trial I, 100 quails aged 4
183 weeks (50 to be fed AS + ASP and 50 to be fed BP + FBP). The method used was the
184 administration of chromium oxide mixed into the feed as much as 2.83 mg/g feed to mark the
185 feces (according to Scott, 1982).

186 Chemical analysis of sample: Nitrogen retention, crude fiber digestibility, metabolic
187 energy, dry matter, crude fat, Ca and P.

188

189 **Biological testing of ASP and FBP diets**

190 Quails were placed in metabolic cages and each cage was occupied by 5 quails and fed
191 with the best treated ASP and FBP and untreated AS and BP of 5 units each mixed with chromic
192 oxide (Cr_2O_3) of 2.83 mg/g feed for the purpose of coloring and marking feces (light green
193 feces). Feed was given ad libitum for 24 hours along with drinking water. The feces were
194 collected for 24 hours (until the mark disappeared) and analyzed for crude protein content (ASP
195 and AS) and crude fiber (FBP and BP), in addition to analyzing the energy content of the best
196 ASP and FBP to determine the metabolic energy content.

197 Data analysis: All data were compared between the best treated AS and FBP and untreated AS
198 and FBP by T-test.

199

200 **Trial 3 : Application of ration to quail**

201 **Experimental design**

202 At this stage, the best proximate analysis results from trial 1 and 2 were used to develop
 203 the ration formula in trial 3. The quail used in this study were 5 weeks old, 240 birds of the
 204 Coturnix-coturnix japonica strain. Data were taken after quail egg production had reached 5%.

205 The research design used was a complete randomized design with 6 treatments and 4
 206 replicates. each replicate consisted of 10 quails. The 6 treatments used were A: 0% ASP + 0%
 207 FBP, B: 20% ASP + 0 FBP, C: 0% ASP + 20% FBP, D: 10% ASP + 10% FBP, E: 15% ASP
 208 + 5% FBP, F: 5% ASP+ 15% FBP. Each replicate consisted of 10 quails. The experiment lasted
 209 for 2.5 months. The treatment ration was formulated with a balanced content of 20% protein
 210 and 2800 Kcal metabolizable energy (ME) based on (NRC 1994). The composition of feed
 211 ingredients, nutrient content (%) and metabolic energy (kcal/kg) of the rations are shown in
 212 Tables 1 and 2.

213

214 Tabel. 1 : Feed ingredients composition (%) in the treatment

Ingredients of feed (%)	Treatment ration					
	A	B	C	D	E	F
Corn	42	21.5	23.5	21.5	21.5	23.5
Rice brand	15	15	13	15	15	13
Soybean meal	20	20	20	20	20	20
Fishmeal	15	15	15	15	15	15
ASP	-	20	-	10	15	5
FBP	-	-	20	10	5	15
Coconut oil	3.5	4	4	4	4	4
Rock flor	4	4	4	4	4	4
Topmix	0.5	0.5	0.5	0.5	0.5	0.5
Total	100	100	100	100	100	100

Table 2. Nutritional content (%) and metabolic energy (kcal/kg) of the threatment ration

Food substances	Treatment ration
-----------------	------------------

	A	B	C	D	E	F
EM	2844.4	2830.4	2834.0	2817.2	2823.6	2835.9
Crude protein	20.27	20.01	20.33	20.31	20.07	20.26
Crude fiber	4.22	4.75	6.33	5.65	5.19	5.90
Crude Lipid	6.02	7.83	7.32	7.50	7.64	7.42
Ca	2.58	2.56	2.67	2.63	2.59	2.63
P	0.81	0.83	0.86	0.85	0.84	0.85

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216 **Data collection**

217 **Ration consumption (g/head):** Ration consumption was measured by calculating the amount
218 of ration given minus the amount of ration left over during the study.

219 **Hen day production (%):** Daily egg production was calculated by dividing the number of
220 eggs on the day in question by the number of hens alive on the same day multiplied by
221 100%.

222 **Egg weight (g/grain):** Egg weight was calculated by weighing eggs every day during the study,
223 then averaged.

224 **Egg mass (g/head/day):** Egg mass was calculated by averaging the percentage of egg
225 production during the study multiplied by the average egg weight.

226 **Ration conversion:** Ration conversion was calculated by comparing the amount of food
227 consumed with egg mass during the study.

228 **Yolk color:** Eggs were collected on 3 consecutive days, then the yolk color was compared with
229 the yolk color on a standard yolk fan (Egg Roche Yolk Colour Fan).

230 **Statistical analysis**

231 Data were analyzed with Variant analysis (ANOVA) through Statistics Systems Analysis
232 (SAS, 1986). Duncans Multiple Range Test (DMRT) will be used to determine differences
233 between treatments (Steel and Torrie, 1991).

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RESULTS

238 **Trial 1: Avocado seed tannin reduction and banana peel fermentation**

239 The average content of tannins and crude protein in Avocado Seed Processing (ASP) is
 240 presented in Table 3. The tannin content ranged from 0.84% to 1.45%, the results of the analysis
 241 of variance showed that the percentage of Husk Ash Water Filtrate (HAWF) had a very
 242 significant effect ($P < 0.01$) on the tannin content of ASP.

243 The crude protein content of ASP with soaking using HAWF is 6.47% to 8.25%. In
 244 general, all treatments (A, B, C and D) decreased crude protein (CP) content compared to
 245 unprocessed avocado seed flour (CP = 10.40%). The results of the analysis of variance showed
 246 that the percentage of HAWF gave a very significantly different effect ($P < 0.01$) on the protein
 247 content of ASP. The results of further tests using the DMRT test showed that the crude protein
 248 content in ASP soaked in HAWF 20% (A3) and 10% (A2) was significantly higher ($P < 0.01$)
 249 than ASP soaked with 30% HAWF (A4) and significantly higher than ASP soaked in water
 250 (A4).

251 Table 3. Effect of processing on tannin and crude protein content of avocado seeds

Parameters (%)	Perlakuan				SE
	A1	A2	A3	A4	
Tanin	1,30 ^a	1,45 ^a	1,24 ^a	0,84 ^b	0,07
Crude protein	7,01 ^b	8,18 ^a	8,29 ^a	6,47 ^b	0,37

252

253 The crude fiber and crude protein content of FermentationBanana Peel (FBP) using
 254 EM4 at doses of 0, 15 and 30 ml/100gr with a duration of 0, 6 and 12 days can be seen in Table
 255 4 and 5. There was no interaction effect between the dose of EM4 and the duration of
 256 fermentation on the crude fiber content of FBP, but the dose of EM4 had a significant effect (P
 257 < 0.05) on the crude fiber content of FBP. Further test with DMRT showed that the dose of
 258 EM4 as much as 15 ml/100 grams of banana peel (B) produced significantly lower crude fiber
 259 content (CF = 13.51%).

260 FBP fermented using EM4 at doses of 0, 15 and 30 ml/100gr with fermentation duration
 261 of 0, 6 and 12 days produced crude protein content of 8.58% - 11.25% as presented in Table 5.
 262 It can be seen that there is no interaction effect of EM4 dose with the duration of fermentation
 263 on the crude protein content of FBP, but the duration of fermentation has a very significant
 264 effect ($P < 0.01$) on the crude protein content of FBP. After further testing using DMRT, it was
 265 found that the length of fermentation of 6 days and 12 days produced a very significant ($P <$
 266 0.01) higher crude protein content in TKPF, namely 11.25% and 11.13%.

267 **Table 4. Crude fiber Content of fermented banana peel**

Dose (ml/100g)	Fermentation time (da)			
	0	6	12	Average
..... %				
A = 0	14,19	15,32	17,30	15,61 ^a
B = 15	12,9	14,47	13,24	13,51 ^b
C = 30	14,03	15,22	16,85	15,37 ^a
Average	13,67	15,00	15,8	
SE				0,59

268 Note : Different superscripts in the same column indicate significantly different (P<0.05)

269 SE = Standar Error

270 Before processing CF content = 15.61%

271

272 **Table 5. Crude protein content of fermented banana peel**

Dose (ml/100g)	Fermentation time (day)			
	0	6	12	Average
..... %				
A = 0	8,38	11,38	12,12	10,63
B = 15	8,95	11,63	10,32	10,30
C = 30	8,40	10,73	10,93	10,02
Average	8,58 ^a	11,25 ^b	11,13 ^b	
SE				0,28

273 Note: different superscripts on the same line indicate significantly different (P<0.01)

274 SE = Standard Error

275 Before processing, crude protein content was 8.58%

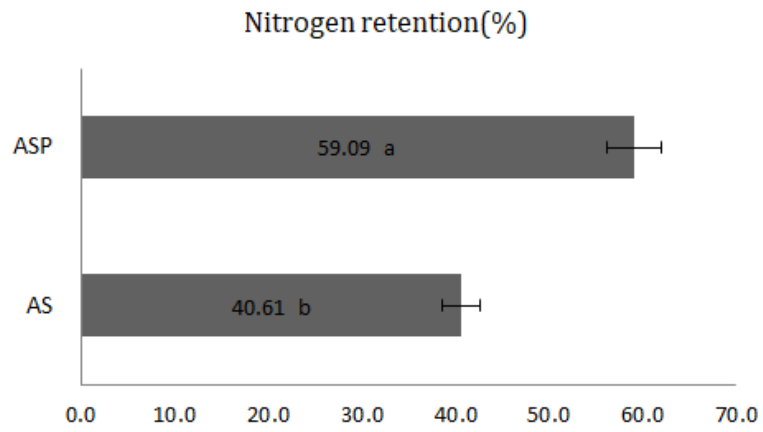
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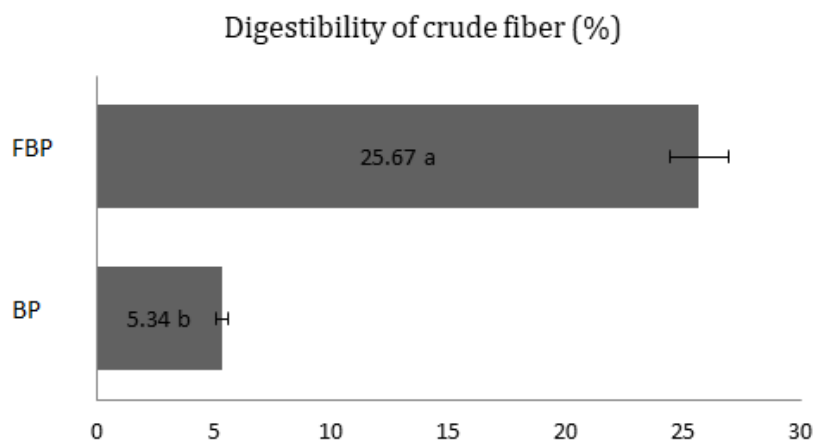
280 **Trial 2: Nitrogen retention test, crude fiber digestibility on best ASP and FBP**



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282 Figure 1. Nitrogen retention of Avocado Seeds Processing (ASP)

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285 Figure 2. Crude fiber digestibility of Fermentation Banana Peel (FBP)

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292 **Trial 3: Ration application to quail**

293 The average consumption, daily egg production, egg weight, egg mass ration conversion and
 294 yolk color index in this study can be seen in Table 8.

295 Table. 6. Average Consumption, Daily Egg Production, Egg Weight, Egg Period, Ration
 296 Conversion and Yolk Color Index During the Study

Parameter	Treatment						SE
	A	B	C	D	E	F	
Ration consumption (g/head/day)	21,44 ^a	14,08 ^c	21,20 ^{ab}	19,90 ^b	15,45 ^c	21,65 ^a	0,46
Egg production (%)	51,16 ^a	5,02 ^d	43,04 ^{ab}	22,38 ^c	9,69 ^d	37,59 ^b	3,32
Egg weight (g/grain)	8,15 ^b	8,38 ^b	9,35 ^a	8,62 ^b	8,27 ^b	9,29 ^a	0,22
Egg mass (g/head/hr)	4,16 ^a	0,42 ^c	4,02 ^a	1,93 ^b	0,79 ^c	3,49 ^a	0,27
Ration conversion	5,32 ^a	35,51 ^c	5,66 ^a	10,76 ^a	23,50 ^b	6,30 ^a	3,16
Yolk color	5,50 ^b	7,50 ^a	7,25 ^a	7,50 ^a	7,84 ^a	8,17 ^a	0,40

297 Note: different superscripts on the same line indicate significantly different (P<0.05) and significantly
 298 different (P<0.01).
 299 SE = Standard Error
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DISCUSSION

313 **Trial 1: Effect of Avocado Seed Processing (ASP) and Fermented Banana Peel (FBP)**

314

315 **Tannin content and crude protein in Avocado Seed Processing (ASP)**

316 The average tannin content in processed avocado seed flour ranges from 0.84% to
317 1.45% as shown in Table 3. The results of the analysis of variance showed that the percentage
318 of husk ash water filtrate (HAWF) had a very significant effect ($P < 0.01$) on the tannin content
319 of ASP.

320 Avocado seed waste soaked with 30% HAWF can reduce tannin levels in ASP by
321 42.86%. The low tannin content (0.84%) in ASP soaked with 30% HAWF is due to a stronger
322 pH value compared to 10% and 20% HAWF, where at 30% HAWF the pH value reaches
323 10.6 which is close to the pH of strong bases such as NaOH which has a pH value of 11.

324 The higher the pH value, the stronger the alkaline strength so that the bound tannins are
325 also more, this causes the tannin content in avocado seed flour to be lower. HAWF 30% which
326 functions as an alkali such as NaOH will bind phenol from the polyphenol bond so that this
327 bound phenol will be wasted with the husk ash filtrate water. In accordance with the opinion
328 of Atanu et al. (2020) that the use of alkaline solutions such as NaOH aims to bind tannin
329 compounds consisting of polyphenol bonds so that the bound tannins will be wasted with water.

330 In Table 3, the crude protein content of ASP with soaking using HAWF is 6.47% to
331 8.25%. In general, all treatments (A, B, C and D) decreased crude protein content compared
332 to unprocessed avocado seed flour (CP = 10.40%). The results of the analysis of variance
333 showed that the percentage of HAWF gave a very significantly different effect ($P < 0.01$) on
334 the protein content of ASP. The results of further tests using the DMRT test showed that the
335 crude protein content in ASP soaked in HAWF 20% (A3) and 10% (A2) was significantly
336 higher ($P < 0.01$) than ASP soaked with 30% HAWF (A4) and significantly higher than ASP
337 soaked in water (A4).

338 The decrease in crude protein content by 37.53% in ASP soaked in 30% HAWF (A4)
339 because the resulting filtrate is classified as a strong base with a pH of 10.6 so that the weakly
340 acidic protein in avocado seeds reacts with HAWF which includes a strong base to form salt.
341 The salt formed is easily soluble in water, when washing avocado seeds some of the protein
342 will be wasted with water (leaching).

343 In addition, at high pH the avocado seed protein undergoes a change in charge which
344 causes a decrease in the attraction between protein molecules so that the molecules are more
345 easily decomposed and the protein dissolved in the husk ash water filtrate increases, this will
346 reduce the crude protein content of ASP because the protein is wasted not only the protein

347 dissolved in the husk ash water filtrate but also the protein that forms salt with the filtrate.
348 According to Lošdorfer (2017), the effect of pH is based on the difference in charge of the
349 amino acids that make up the protein, which affects the attraction between protein molecules.

350

351 **Effect of fermentation on crude fiber and crude protein content of fermented banana peel** 352 **(FBP)**

353 The crude fiber content of FBP fermented using EM4 at doses of 0, 15 and 30 ml/100gr
354 with a duration of 0, 6 and 12 days can be seen in Table 5. There was no interaction effect
355 between the dose of EM4 and the duration of fermentation on the crude fiber content of FBP,
356 but the dose of EM4 had a significant effect ($P < 0.05$) on the crude fiber content of FBP.
357 Further test with DMRT showed that the dose of EM4 as much as 15 ml/100 grams of banana
358 peel (B) produced a significantly lower crude fiber content (CF= 13.51%).

359 The decrease in crude fiber content at a dose of 15 ml / 100 grams (B) was 15.54%
360 because at this dose the microbes that digest crude fiber work optimally, one type of
361 microorganism contained in EM4 is bacteria (streptomyces sp) that produce cellulase enzyme.
362 Cellulase enzyme can degrade the crude fiber found in banana peel. During fermentation, the
363 lignocellulose bonds in banana peels are broken because the lignolytic microbes in EM4 help
364 break down the lignocellulose bonds so that cellulose and lignin can be released from these
365 bonds by the lignase enzyme. This causes a decrease in crude fiber content in banana peels
366 fermented with EM4 in treatment B.

367 This research is also in line with the research of Kumar et al (2020) which states that
368 microbial starters such as EM4 reduce the cell wall content (NDF) of rice straw because during
369 fermentation there is a breaking of the lignocellulosic bonds of rice straw. Lignolytic microbes
370 in EM4 help break down lignocellulose bonds so that cellulose and lignin can be released from
371 these bonds by the lignase enzyme.

372 Banana peel fermented using EM4 at doses of 0, 15 and 30 ml/100gr with fermentation
373 duration of 0, 6 and 12 days produced crude protein content of 8.58% - 11.25% as presented in
374 Table 5. It can be seen that there is no interaction effect of EM4 dose with the duration of
375 fermentation on the crude protein content of FBP, but the duration of fermentation has a very
376 significant effect ($P < 0.01$) on the crude protein content of FBP. After further testing using
377 DMRT, it was found that the length of fermentation of 6 days and 12 days produced a very
378 significant ($P < 0.01$) higher crude protein content in FBP, namely 11.25% and 11.13%.

379 The crude protein content in FBP fermented for 6 days and 12 days increased by 31.12%
380 and 29.72%. The high crude protein content in FBP fermented with EM4 for 6 days and 12
381 days is due to the microbes in EM4 that continue to grow and develop as the fermentation time
382 increases, then the microbes will increase the crude protein content of banana peels because
383 microbes are single cell proteins that increase the crude protein content in FBP.

384 Protein levels in fermentation can increase due to an increase in decomposing microbes
385 that die because they cannot survive in an acidic atmosphere (Sharma 2020). Furthermore,
386 Bhatia (2013) also explained that microbes are single cell proteins so that they can indirectly
387 increase crude protein content.

388 Crude protein content at 0 days of fermentation (CP = 8.58%) was significantly lower
389 because at 0 days the microbes in EM4 had not grown and developed. From the results of this
390 study it was found that the dose of EM4 15 ml/100 grams can reduce crude fiber to 13.50% in
391 FBP and 6 days of fermentation can increase crude protein content to 11.25%.

392 **Trial 2: Nitrogen retention test on best ASP and crude fiber digestibility test on best FBP**

393 **Nitrogen retention value of ASP**

394 Nitrogen retention is the amount of nitrogen consumed and can be retained by the body
395 of livestock to be used in the metabolic process so that the greater the nitrogen retention value
396 of a feed ingredient, the better it is for the metabolic process of quail. The amount of nitrogen
397 retained is obtained from the reduction of nitrogen consumed in feed ingredients with the
398 amount of nitrogen excreted through feces and urine.

399 The nitrogen retention value of untreated avocado seed flour and processed avocado
400 seed flour (ASP) in this study can be seen in Fig. 1. The average nitrogen retention value in
401 untreated avocado seed flour (control) is 37.49%, this value is lower than the average nitrogen
402 retention in the best TBAO in phase I research (soaked with 30%) which HAWF) reached
403 59.09%. After conducting a T test, it was found that the value of N retention in ASP was very
404 significantly higher ($P < 0.01$).

405 The nitrogen retention value of the best ASP increased by 57.62% compared to
406 Avocado seeds without processsing. Nitrogen retention of ASP is higher even though the
407 crude protein content is lower because the tannin content is lower so that the protein bound to
408 the tannin that forms a complex compound is also reduced, this causes the digestibility of ASP
409 protein in quail to increase so that less nitrogen is released through feces and urine. Reduced
410 nitrogen excreted by quail with feces and urine can increase the nitrogen retention value. The

411 level of nitrogen retention depends on the metabolic energy of the ration, protein consumption,
412 protein digestibility coefficient, protein quality, and the balance of amino acids in the ration
413 (Wahju 1997).

414 Conversely, in unprocessed avocado seeds (control) although the protein content is
415 higher than processed avocado seed flour due to the high content of tannins that bind to proteins
416 in avocado seeds so that protein digestibility is reduced which causes the nitrogen retention
417 value to drop. Tannins can suppress nitrogen retention and result in decreased digestibility of
418 amino acids (Calislar 2017). Furthermore, Hassan et al (2020) stated that tannins are
419 polyphenolic compounds that have the ability to precipitate proteins, namely by forming
420 insoluble complexes that can reduce protein digestibility.

421

422 **Crude Fiber Digestibility Value of Fermentation banana peel**

423 The crude fiber digestibility values of untreated banana peel flour (BP) and fermented
424 banana peel flour (FBP) can be seen in Figure 2. The best crude fiber digestibility value of FBP
425 in experiment 1 was 25.67%, while that of unfermented banana peel flour (control) was only
426 5.34%. After T test, it was found that the crude fiber digestibility of fermented banana peel
427 flour (FBP) was significantly higher ($P < 0.01$) than the control.

428 Fermentation of banana peel with EM4 is able to increase the fiber digestibility of
429 banana peel flour almost five times that of banana peel flour without fermentation, this is
430 because during fermentation the enzymes produced by microbes in EM4 can break
431 lignocellulose bonds in banana peel and cellulose is then degraded by cellulase enzymes while
432 lignase will break down lignin.

433 Fiber fractions have been partially broken down by microbes contained in EM4 so that
434 in the digestive process in the quail's body more crude fiber is digested and absorbed, which in
435 turn will increase the digestibility of crude fiber in FBP. According to Dilaga et al. (2022)
436 during the fermentation process there is a breaking of lignocellulose bonds in rice straw.

437 In quail, a high value of crude fiber digestibility is very important in the metabolic
438 process because the digestive process of quail does not produce enzymes that are able to
439 degrade crude fiber, this can be seen with the low value of crude fiber digestibility in banana
440 peel flour without fermentation (control) because the fiber fractions contained in banana peels
441 cannot be broken down in the digestive process.

442 **Trial 3: Ration treatment to livestock**

443 The results of trial 1 showed that avocado seed meal soaked with 30% HAWF produced
444 the lowest tannin content and banana peel flour fermented using EM4 at a dose of 15 ml/100
445 grams with a fermentation duration of 6 days produced the lowest crude fiber content and
446 higher crude protein. The best ASP and FBP need to be tested biologically in the field by using
447 them in the ration composition of laying quail.

448

449 **Effect of ASP and FBP on quail ration consumption.**

450 Ration consumption of quail fed ASP and FBP ranged from 14.08 - 21.65
451 grams/head/day. The results of the analysis of variance showed that the use of ASP and FBP
452 in the ration gave a very significant difference ($P < 0.01$) to the consumption of quail rations.
453 The consumption of treatments C and F were not significantly different from the control (A),
454 this is because the control ration (A) and rations containing 20% FBP (C) and 15% FBP (F)
455 have the same level of palatability so that the ration consumption is also not significantly
456 different. FBP which has a pleasant smell and aroma is favored by quail, so the reduction in
457 the use of corn substituted with FBP 20% and 15% in the ration has no effect on quail ration
458 consumption. According to Canogullari (2016) that consumption is not only influenced by the
459 energy content and food substances of the ration, the health of the livestock, but also by the
460 smell and shape of the ration.

461 Ration consumption of B, D and E was significantly lower than A (control) due to the
462 presence of tannins in ASP which caused a bitter and astringent taste, thus reducing the level
463 of palatability which had an effect on reducing quail ration consumption. In accordance with
464 the opinion of Hassan et al. (2020) which states that the bitter and astringent taste caused by
465 the presence of tannins can cause low chicken consumption.

466

467 **Effect of ASP and FBP in Rations on daily egg production (hen day) of Quail.**

468 The average daily egg production of quail ranged from 5.02% to 51.16%, the results of
469 the analysis of variance showed that the use of ASP and FBP in the ration produced very
470 significant differences ($P < 0.01$) on daily egg production of quail. Quails that consume ration
471 C have daily egg production that is not significantly different from A (control), this is because

472 the consumption of C and A is also not significantly different, so the nutrients consumed for
473 egg production are the same.

474 Daily egg production in quails consuming rations B, D, E and F was significantly
475 different from A (control). The low egg production of B, D, E and F was due to low
476 consumption and the presence of tannin in the ration. Low consumption causes the nutrients
477 consumed to produce are not fulfilled, thus reducing egg production.

478 Daily egg production in A (control) was significantly higher than F although
479 consumption between A and F was not significantly different, it is suspected that there are
480 alkaloids or other compounds in ASP besides tannins that can reduce quail production, one of
481 which is thought to be the high content of triterpenoids. The results of research by Setyawan et
482 al (2021) showed that in addition to tannins, triterpenoids were also found in avocado seeds,
483 furthermore Farmatrade (2023) explained that 0.9% triterpenoids in the diet reduced growth
484 and fat digestibility.

485 Daily egg production of quails consuming ration B was significantly lower than the
486 others due to its very low consumption and high tannin content in the ration, while quails
487 consuming rations D and E had daily egg production that was not significantly different even
488 though the consumption of D was significantly higher ($P < 0.05$) than E due to the higher tannin
489 content in D. The daily egg production of quails consuming rations D and E was not
490 significantly different.

491 **Effect of ASP and FBP in Ration on Quail Egg Weight**

492 From the results of this study, quail egg weight ranged from 8.15 grams to 9.35 grams.
493 The use of ASP and FBP in quail rations gave a very significantly different effect ($P < 0.01$) on
494 quail egg weight. Quail consuming rations C and F had a significantly higher egg weight
495 compared to A (control) while the egg weight of B, D and E were not significantly different
496 from A (control).

497 The higher egg weight in treatments C and F is because at a good consumption level
498 TKPF can slow down sexual maturity so that the age of first laying quail is longer which will
499 result in greater egg weight. According to Revelation (1997) young chickens whose sex
500 maturity is slowed down produce larger eggs than chickens whose sex maturity is not slowed
501 down.

502 Quails consuming rations C and F reached sexual maturity at 52 and 54 days of age,
503 this age of sexual maturity was slower than ration A (control) which reached sexual maturity
504 at 45 days. Jaya (2012) reported that quails that are slowed to sexually mature at the age of 50-

505 55 days are more profitable because they have a larger egg size, longer production peak, longer
506 production life and decreased mortality.

507 FBP can slow down the sex maturity of quail because FBP has high crude fiber. The
508 nature of fibrous food is bulky so there is a tendency for transit time in the digestive organs to
509 be very short, resulting in a decrease in nutrient absorption (including fat and its components
510 such as cholesterol). As a result of the inhibition of cholesterol absorption, the ovaries are
511 inhibited in synthesizing the hormone estrogen, thus inhibiting the formation of egg follicles
512 which ultimately slows down the age of sexual maturity. One of the roles of cholesterol is as a
513 precursor of several steroid hormones such as estrogen and testosterone (Craig et al. 2023).

514 In treatments B, D and E, very low consumption will cause low protein consumption
515 so that the egg weight is not significantly different from A (control), low protein consumption
516 will result in low yolk weight and egg albumen. According to Shim et al. (2013) that the weight
517 of the yolk and the size of the egg is also influenced by protein consumption, if protein
518 consumption is low it will form yolk and low egg weight.

519 **Effect of ASP and FBP in ration on quail egg mass**

520 The average egg mass produced in the study was 0.42 gr/day to 4.16 gr/hr. Analysis of
521 variance showed that there was a very significant difference ($P < 0.01$) in the effect of the use
522 of ASP and FBP on quail egg mass. Quail consuming rations C and F had egg masses that were
523 not significantly different from A (control), while quail consuming rations B, D and E had egg
524 masses that were significantly lower than A (control).

525 The fact that treatments C and F did not differ from A (control) was influenced by egg
526 production and egg weight. In quail that consumed ration C had the same egg production as A
527 (control), while in treatment F although the egg production was lower than A (control) but
528 because the egg weight was higher than A which ultimately resulted in egg mass that was not
529 significantly different from A (control). Egg mass is highly dependent on egg weight and daily
530 egg production because egg mass is obtained from the multiplication of egg weight with daily
531 egg production. According Shim et al. (2013) egg mass is closely related to egg weight and
532 egg production produced.

533 In Table 11 it can also be seen that the egg mass in quails consuming rations B, D and
534 E is very significantly lower ($P < 0.01$) than A (dick), this is due to egg weight and daily egg
535 production which is also significantly lower than A. Likewise, quail consuming ration D had
536 an egg mass that was very significantly ($P < 0.01$) lower than A, C, and F but very significantly
537 higher than B and E, this was also due to the daily egg production produced in D which was

538 also very significantly lower ($P < 0.01$) than A, C and F and very significantly higher than B and
539 E.

540 **Effect of Using ASP and FBP in Ration on Ration Conversion of Quail**

541 The lower the ration conversion rate, the more efficient the amount of feed consumed
542 in producing eggs. Ration conversion is obtained from the quotient of the amount of feed
543 consumed with egg mass. The average ration conversion value as shown in Table 11 is 5.32 -
544 35.51. From the results of the analysis of variance, there was a very significant difference
545 ($P < 0.01$) due to the use of ASP and FBP in quail rations on ration conversion.

546 Quail that consumed rations C, D and F ration conversion was not significantly different
547 from A (control), this is due to ration consumption and egg mass resulting in the same ration
548 conversion. In treatment D, although the ration conversion was not significantly different from
549 A (control), the conversion rate tended to be higher because the egg mass was very significantly
550 lower than A. The ration conversion of B and E was very significantly higher than A (control)
551 because the egg mass was very significantly lower, resulting in a large conversion rate.

552 The ration conversion rate in B is very significantly greater ($P < 0.01$) which reached
553 35.51 due to very low daily egg production which is only 5% so that the egg mass is also very
554 small, although the ration consumption of B is very significantly lower but because the
555 production is very small resulting in a very large ration conversion rate. According to Rasyaf
556 (1995) ration conversion is the ratio between the amount of ration consumed compared to the
557 amount of egg production in a certain unit of time.

558 From this study, it can be seen that the use of ASP at the level of 15% (E) and 20% (B)
559 in quail rations is inefficient, this is indicated by the very large conversion rate. The use of FBP
560 up to the level of 20% (C) in the quail ration is efficient because it produces conversion rates
561 that are not significantly different from the control ration.

562 **Effect of ASP and FBP in ration on quail yolk color**

563 The higher the yolk score value, the better because the yolk color is more yellow. The
564 results of the analysis of variance showed that the use of ASP and FBP in quail rations produced
565 very significant differences ($P < 0.01$) on the yolk color index. After further testing with DMRT,
566 it was found that the yellow color index in B, C, D, E and F was significantly higher than A
567 (control).

568 The high yolk color index in rations containing ASP and FBP (A, B, C, D, E and F) is
569 due to the high content of vitamin A or carotene in ASP which reaches 27.2 IU/g and the

570 content of β -carotene in FBP which is 45 mg/100 g. This can increase the amount of carotene
571 pigments in the yolk thus increasing the yolk color index in quail eggs. This can increase the
572 amount of carotene pigment in the egg yolk, thus increasing the yellow color index in quail
573 eggs. According to Kljak et al. (2021), egg yolk color is closely related to the vitamin A content
574 in the ration, the higher the vitamin A consumed, the carotene pigment and egg yolk color will
575 also increase.

576 The high content of β -carotene in FBP also causes an increase in the yolk color index.
577 According to Hausman & Sandman (2000), β carotene is an unstable carotenoid compound
578 because it is easily oxidized into xanthophyll. Xanthophyll functions for yolk coloration.
579 Xanthophyll cannot be synthesized by the chicken body, but is obtained from a ration
580 consisting of feed ingredients containing xanthophyll.

581 The higher the yolk index value, the more favorable it is to consumers. From the results
582 of this study, the yolk color index value of quail fed the treatment rations (B, C, D, E and F)
583 ranged from 7.3 to 8.2, this value was higher than the yolk color index value of quail fed the
584 control ration (A) which was only 5.8. The yolk color index value of eggs fed with ASP and
585 FBP in the diet was higher than the yolk index value of quail eggs in general. From the results
586 of previous research conducted by Sestilawati (2011), the yolk color index only ranged from
587 5.78 to 6.42.

588 The results of phase III of this study showed that the use of 20% ASP (ration C) or
589 5%ASP + 15% (ration F) in the ration of laying quail can reduce the use of corn by 44% with
590 better performance and egg quality.

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Conclusion

595 Processing avocado seeds through soaking with 30% husk ash water filtrate (HAWF) for
596 48 hours can reduce tannin content in seeds by 42.86%, but crude protein content decreased by
597 37.53% and increased nitrogen retention by 57.62%.

598 Fermentation of banana peel using EM4 at a dose of 15 ml/100 g and fermentation duration
599 of 6 days can reduce 15.54% of crude fiber content and increase crude protein content by
600 31.12% and increase crude fiber digestibility by 380%.

601 The rations that gave the best response on performance and egg quality were rations C
602 (20% FBP) and F (5%ASP + 15%FBP), which could reduce the use of corn by 44%.

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606 **Author's Contribution**

607 Ade djulardi was in charge to supervise the experiment and writing the original script. Hera
608 dwi triani and Ahadiyah yuniza conducted the experiment, analyzed the data and finalize
609 manuscript.

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1 **Study of avocado seed and banana peel processing as corn element substitution in**
2 **Japanese quail (*Coturnix-coturnix japonica*) ration**

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4 **MAJOR REVISION: Re-Evaluation**

- 5 **1. Paper is stretched much, should be reduce by 2000 to 2500 words.**
6 **2. Overall, paper is not formatted properly.**
7 **3. Discussion and Tables need much more attention.**
8 **4. Language be improved.**
9 **5. References need formatting properly.**

10
11 **Novelty Statement:** The combination of avocado seeds and banana peels processed into
12 rations is one of the alternative breakthroughs in quail ration ingredients to replace the use of
13 corn by utilizing agricultural waste so that it can also reduce feed costs.

14
15 **ABSTRACT**

16
17 This study aims to use avocado seeds and banana peels processed into rations to replace the
18 use of corn by utilizing agricultural waste so that it can also reduce feed costs. This research
19 consists of 3 stages of experiments, namely, experiment 1: processing avocado seed flour and
20 banana peel flour to improve its quality. Experiment 2: the results of stage 1 research were
21 carried out direct biological tests to livestock to see digestibility, stage 3 research: application
22 of avocado seed and banana peel-based rations to quail. The results showed that Avocado
23 Seed Processing (ASP) through soaking with 30% Husk Ash Water Filtrate (HAWF) for 48
24 hours can reduce tannin content in seeds by 42.86%, but crude protein content decreased by
25 37.53% and increased nitrogen retention by 57.62%. Fermentation of Banana Peel (FBP)
26 using EM4 at a dose of 15mL/100g and fermentation duration of 6 days can reduce 15.54%
27 of crude fiber content and increase crude protein content by 31.12% and increase crude fiber
28 digestibility by 380%. It was concluded that the ration that gave the best response on
29 performance and egg quality was ration C (20% FBP) and F (5% ASP + 15% FBP) so that it
30 could reduce the use of corn by 44%.

31 **Key words:** quail, avocado seed, banana peel

32
33 **INTRODUCTION**

34

35 The poultry sector is one of the livestock sectors that plays an important role in meeting
36 animal protein needs, both poultry as egg producers and as meat producers. The short
37 maintenance time of poultry to produce meat and egg production is one of the reasons poultry
38 farming has the potential to be developed. In addition, the price of protein sources from
39 poultry consisting of meat and eggs is also cheaper and affordable by the purchasing power
40 of the Indonesian people in general, this causes the demand for eggs and poultry meat to
41 increase.

42 Quail is one of the various types of poultry livestock that is good to continue to be developed
43 because quail is known as a good egg producer and fast sex maturity. Quail have high egg
44 production, reaching 200 to 300 eggs per bird per year with simpler maintenance
45 management (Thomas et al. 2020). In addition, quail growth is faster and relatively does not
46 require a large area for maintenance, so quail is one of the livestock that can provide a source
47 of animal protein, especially quail eggs, for the community at a relatively low price.

48 In quail farming, farmers are always faced with the problem of increasing feed prices because
49 some feed ingredients are still imported and the availability of feed is limited, while this feed
50 factor is an important factor in the success of quail farming because 60% to 70% of the costs
51 in raising quail include feed costs (Redoy et al. 2017). This encourages farmers to look for
52 alternative feed ingredients or unconventional feed ingredients that are waste or by-products
53 of agriculture or other fields. One of the wastes that can be utilized is avocado seeds and
54 banana peels which can be used as one of the energy source feed ingredients.

55 Avocado seeds and banana peels have the potential to be used as energy source feed.
56 According to BPS (2018), West Sumatra Province in 2010 produced 29,457 tons of avocado
57 fruit, while banana fruit was 160,516 tons so that the avocado seeds produced were
58 approximately 7,364 tons and 48,154 tons of banana peels, this is because the weight of
59 avocado seeds is 25% of avocado fruit and many banana peels are 30% of banana fruit.

60 Avocado seeds in poultry can reduce the use of corn and bran. According to Safrida et al.
61 (2021) the metabolic energy content of avocado seeds (EM = 3570 Kcal) is higher than that
62 of corn (EM = 3400 Kcal), while the protein content of avocado seeds (10.4%) is also higher
63 than the protein content in corn (8.5%). However, the use of avocado seeds as feed
64 ingredients in quail rations cannot be directly because avocado seeds contain quite high
65 tannins, which are around 1.47% and while poultry can only tolerate tannins 0.5% (Choi et al.
66 2020), so to reduce tannin levels in avocado seeds, processing is carried out first such as
67 soaking with water or alkaline solutions.

68 According to Dahyuni (2004) tannin levels in avocado seeds can be reduced through soaking
69 with alkaline solutions such as NaOH. NaOH will bind tannins consisting of polyphenol
70 bonds so that when washing tannins that have been bound by NaOH will be wasted with
71 water. The husk ash substrate can be used as a cheap and easily available NaOH replacement
72 alkaline solution, this is in accordance with the opinion of Jamarun et al. (2021) which
73 explains that husk ash water functions as a base that is cheap and easily obtained in rural
74 areas, it can be used as a substitute for NaOH, Furthermore, Sari et al. (2022) also explained
75 that hydrolysis with husk ash water is more profitable than other types of alkali. The use of
76 processed avocado seeds with NaOH up to 20% does not interfere with quail performance,
77 while above 20% causes quail performance to decline (Dahyuni 2004).

78 **No space between value and units**

79 In addition to avocado seeds, another waste that can also be utilized as poultry feed is banana
80 peels. In terms of composition, banana peels have a gross energy content of **4363 Kcal/Kg**
81 and crude protein of 8.36% and a very high vitamin A content, especially provitamin A,
82 namely beta-carotene, of **45 mg per 100 grams** dry weight (Nurkholis 2005). Beta-carotene
83 acts as an antioxidant. In addition, banana peel also contains carbohydrates, especially
84 extracts without nitrogen at 66.20% (Ziaul and Muneera 2022), so it can be used as an
85 energy source feed ingredient to replace some corn or bran in the ration.

86 The utilization of banana peels in quail rations cannot be maximized due to its high crude
87 fiber content of 15% (Ryan et al. 2011), so to reduce the crude fiber content and increase the
88 nutritional value of banana peels can be done by fermentation. Fermentation with EM 4 can
89 reduce the crude fiber content of feed ingredients. The results of research by Mirzah et al.
90 (2007) stated that fermentation of shrimp waste with EM4 at a dose of 20ml/100 g substrate
91 fermented for 11 days produced good nutritional value in shrimp waste and among others
92 could reduce crude fiber content.

93 Santoso et al. (2008) research showed that EM4 is very effective in reducing crude fiber of
94 cassava leaves from 29.74% to 22.04%, EM4 is thought to produce a large amount of crude
95 fiber digesting enzymes such as cellulose and mannase (Rostika et al. 2017). The advantage
96 of *Lactobacillus* in EM4 in digesting crude fiber is because the bacteria do not produce crude
97 fiber in their activity, and so they are more effective in reducing crude fiber. The use of
98 banana peels up to 20% does not affect the growth of broilers, if it reduces body weight
99 (Ziaul and Muneera 2022).

100 The use of avocado seed waste soaked with husk ash water filtrate and banana peel fermented
101 with EM4 in the ration of laying quail can be used as an energy source feed ingredient to
102 reduce the use of corn so as to reduce feed costs which will ultimately increase profits.

103

104

MATERIALS AND METHODS

105

Ethical approval

106 The present study was approved by the Animal Ethics Committee of Andalas University,
107 West Sumatera, Indonesia.

109

Experimental site

Trial 1: Preparation of Processed Avocado Seed Flour (ASP) and Fermented Banana 112 Peel Flour (FBP)

113

Tannin reduction of avocado seed with husk ash filtrate

114 The processing process for avocado seeds is thinly slicing then soaking with: water (A1),
115 soaking with 10% husk ash filtrate (A2), soaking with 20% husk ash filtrate (A3) and soaking
116 with 30% husk ash filtrate (A4), each for 48 hours. After the avocado seeds were soaked,
117 they were dried in the hot sun. After drying, the avocado seeds are ground and made into
118 Processed Avocado Seed Flour (ASP).

119 Avocado seed processed samples were tested for tannin content using the hide powder
120 method and crude protein content using the AOAC (2005) method.

122

Fermentation of Banana Peel (FBP)

123 The washed banana peels were cut into small pieces and then subjected to 3 treatments,
124 namely fermentation with EM4 with doses: ~~0 ml, 15 ml and 30 ml per 100g~~ 0, 15, and
125 30mL/100g of material with fermentation duration of 0, 6 and 12 days. This treatment aims to
126 reduce the crude fiber content and improve the nutritional quality of the banana peel. After
127 the banana peels were fermented, they were dried in the sun to make Banana Peel Flour. To
128 see the effect of fermentation, crude fiber and crude protein were tested according to AOAC
129 (2005) procedure.

131

Trial 2: Biological tests (nitrogen retention of ASP and crude fiber digestibility of FBP)

133 Trial 2 included biological tests on the best trial 1 treatments consisting of N retention for
134 avocado seed and crude fiber digestibility for banana peel. Then the best results of the
135 treatment of Avocado Seed Flour (ASP) and Banana Peel Flour (FBP) were also determined
136 for metabolic energy content. Furthermore, laboratory tests were carried out in the form of
137 proximate tests of the best ASP and FBP which aimed to determine how much nutritional
138 content (water content, crude fat, Ca and P) would be used for ration formulation in trial 3.
139 The materials used were: the best ASP and FBP samples in trial I, 100 quails aged 4 weeks
140 (50 to be fed AS + ASP and 50 to be fed BP + FBP). The method used was the administration
141 of chromium oxide mixed into the feed as much as 2.83 mg/g feed to mark the feces (Scott
142 1982).

143 Chemical analysis of sample: Nitrogen retention, crude fiber digestibility, metabolic energy,
144 dry matter, crude fat, Ca and P.

145

146 **Biological testing of ASP and FBP diets**

147 Quails were placed in metabolic cages and each cage was occupied by 5 quails and fed with
148 the best treated ASP and FBP and untreated AS and BP of 5 units each mixed with chromic
149 oxide (Cr_2O_3) of 2.83 mg/g feed for the purpose of coloring and marking feces (light green
150 feces). Feed was given ad libitum for 24 hours along with drinking water. The feces were
151 collected for 24 hours (until the mark disappeared) and analyzed for crude protein content
152 (ASP and AS) and crude fiber (FBP and BP), in addition to analyzing the energy content of
153 the best ASP and FBP to determine the metabolic energy content.

154 Data analysis: All data were compared between the best treated AS and FBP and untreated
155 AS and FBP by T-test.

156

157 **Trial 3: Application of ration to quail**

158 **Experimental design**

159 At this stage, the best proximate analysis results from trial 1 and 2 were used to develop the
160 ration formula in trial 3. The quail used in this study were 5 weeks old, 240 birds of the
161 Coturnix-coturnix japonica strain. Data were taken after quail egg production had reached
162 5%.

163 The research design used was a complete randomized design with 6 treatments and 4
164 replicates. each replicate consisted of 10 quails. The 6 treatments used were A: 0% ASP + 0%
165 FBP, B: 20% ASP + 0 FBP, C: 0% ASP + 20% FBP, D: 10% ASP + 10% FBP, E: 15% ASP
166 + 5% FBP, F: 5%ASP+ 15% FBP. Each replicate consisted of 10 quails. The experiment

167 lasted for 2.5 months. The treatment ration was formulated with a balanced content of 20%
168 protein and 2800 Kcal metabolizable energy (ME) based on (NRC 1994). The composition of
169 feed ingredients, nutrient content (%) and metabolic energy (kcal/kg) of the rations are shown
170 in Tables 1 and 2.

171

172 **Data collection (Too many headings; write these all in a paragraph without headings)**

173 **Ration consumption (g/head):** Ration consumption was measured by calculating the amount
174 of ration given minus the amount of ration left over during the study.

175 **Hen day production (%):** Daily egg production was calculated by dividing the number of
176 eggs on the day in question by the number of hens alive on the same day multiplied by 100%.

177 **Egg weight (g/grain):** Egg weight was calculated by weighing eggs every day during the
178 study, then averaged.

179 **Egg mass (g/head/day):** Egg mass was calculated by averaging the percentage of egg
180 production during the study multiplied by the average egg weight.

181 **Ration conversion:** Ration conversion was calculated by comparing the amount of food
182 consumed with egg mass during the study.

183 **Yolk color:** Eggs were collected on 3 consecutive days, then the yolk color was compared
184 with the yolk color on a standard yolk fan (Egg Roche Yolk Colour Fan).

185 **Statistical analysis**

186 Data were analyzed with Variant analysis (ANOVA) through Statistics Systems Analysis
187 (SAS, 1986). Duncans Multiple Range Test (DMRT) will be used to determine differences
188 between treatments (Steel and Torrie, 1991).

189

190

RESULTS

191 **Write P value as (P<0.01); no space before and after =**

192 **Trial 1: Avocado seed tannin reduction and banana peel fermentation**

193 The average content of tannins and crude protein in Avocado Seed Processing (ASP) is
194 presented in Table 3. The tannin content ranged from 0.84% to 1.45%, the results of the
195 analysis of variance showed that the percentage of Husk Ash Water Filtrate (HAWF) had a
196 very significant effect (P < 0.01) on the tannin content of ASP.

197 The crude protein content of ASP with soaking using HAWF is 6.47% to 8.25%. In general,
198 all treatments (A, B, C and D) decreased crude protein (CP) content compared to unprocessed
199 avocado seed flour (CP = 10.40%). The results of the analysis of variance showed that the
200 percentage of HAWF gave a very significantly different effect (P < 0.01) on the protein

201 content of ASP. The results of further tests using the DMRT test showed that the crude
202 protein content in ASP soaked in HAWF 20% (A3) and 10% (A2) was significantly higher (P
203 < 0.01) than ASP soaked with 30% HAWF (A4) and significantly higher than ASP soaked in
204 water (A4).

205 The crude fiber and crude protein content of FermentationBanana Peel (FBP) using EM4 at
206 doses of 0, 15 and 30 ml/100gr with a duration of 0, 6 and 12 days can be seen in Table 4
207 and 5. There was no interaction effect between the dose of EM4 and the duration of
208 fermentation on the crude fiber content of FBP, but the dose of EM4 had a significant effect
209 ($P < 0.05$) on the crude fiber content of FBP. Further test with DMRT showed that the dose
210 of EM4 as much as 15 ml/100 grams of banana peel (B) produced significantly lower crude
211 fiber content (CF = 13.51%).

212 FBP fermented using EM4 at doses of 0, 15 and 30 ml/100gr with fermentation duration of 0,
213 6 and 12 days produced crude protein content of 8.58% - 11.25% as presented in Table 5. It
214 can be seen that there is no interaction effect of EM4 dose with the duration of fermentation
215 on the crude protein content of FBP, but the duration of fermentation has a very significant
216 effect ($P < 0.01$) on the crude protein content of FBP. After further testing using DMRT, it
217 was found that the length of fermentation of 6 days and 12 days produced a very significant
218 ($P < 0.01$) higher crude protein content in TKPF, namely 11.25% and 11.13%.

219

220 **Trial 2: Nitrogen retention test, crude fiber digestibility on best ASP and FBP**

221 **Trial 3: Ration application to quail**

222 The average consumption, daily egg production, egg weight, egg mass ration conversion and
223 yolk color index in this study can be seen in Table 8.

224

225

DISCUSSION

226 **Discussion seems more results presentation, Why? and why not? with support of**
227 **published literature in badly missing.**

228 **Trial 1: Effect of Avocado Seed Processing (ASP) and Fermented Banana Peel (FBP)**

229 **Tannin content and crude protein in Avocado Seed Processing (ASP)**

230 **The average tannin content in processed avocado seed flour ranges from 0.84% to**
231 **1.45% as shown in Table 3. The results of the analysis of variance showed that the percentage**
232 **of husk ash water filtrate (HAWF) had a very significant effect ($P < 0.01$) on the tannin**
233 **content of ASP.**

234 The average content of tannins and crude protein in Avocado Seed Processing (ASP) is
235 presented in Table 3. The tannin content ranged from 0.84% to 1.45%, the results of the
236 analysis of variance showed that the percentage of Husk Ash Water Filtrate (HAWF) had a
237 very significant effect ($P < 0.01$) on the tannin content of ASP.

238 **Above (blue shaded is discussion) and below (yellow shaded) are**
239 **results; what is the difference between???? Then go for combine**
240 **presentation of Results and Discussion? Reapitition will be**
241 **avoided.**

242 Avocado seed waste soaked with 30% HAWF can reduce tannin levels in ASP by 42.86%.
243 The low tannin content (0.84%) in ASP soaked with 30% HAWSF is due to a stronger pH
244 value compared to 10% and 20% HAWSF, where at 30% HAWSF the pH value reaches 10.6
245 which is close to the pH of strong bases such as NaOH which has a pH value of 11.

246 The higher the pH value, the stronger the alkaline strength so that the bound tannins
247 are also more, this causes the tannin content in avocado seed flour to be lower. HAWF 30%
248 which functions as an alkali such as NaOH will bind phenol from the polyphenol bond so that
249 this bound phenol will be wasted with the husk ash filtrate water. In accordance with the
250 opinion of Atanu et al. (2020) that the use of alkaline solutions such as NaOH aims to bind
251 tannin compounds consisting of polyphenol bonds so that the bound tannins will be wasted
252 with water.

253 In Table 3, the crude protein content of ASP with soaking using HAWF is 6.47% to 8.25%.
254 In general, all treatments (A, B, C and D) decreased crude protein content compared to
255 unprocessed avocado seed flour ($CP = 10.40\%$). The results of the analysis of variance
256 showed that the percentage of HAWF gave a very significantly different effect ($P < 0.01$) on
257 the protein content of ASP. The results of further tests using the DMRT test showed that the
258 crude protein content in ASP soaked in HAWF 20% (A3) and 10% (A2) was significantly
259 higher ($P < 0.01$) than ASP soaked with 30% HAWF (A4) and significantly higher than ASP
260 soaked in water (A4).

261 The decrease in crude protein content by 37.53% in ASP soaked in 30% HAWF (A4) because
262 the resulting filtrate is classified as a strong base with a pH of 10.6 so that the weakly acidic
263 protein in avocado seeds reacts with HAWF which includes a strong base to form salt. The
264 salt formed is easily soluble in water, when washing avocado seeds some of the protein will
265 be wasted with water (leaching).

266 In addition, at high pH the avocado seed protein undergoes a change in charge which
267 causes a decrease in the attraction between protein molecules so that the molecules are more
268 easily decomposed and the protein dissolved in the husk ash water filtrate increases, this will
269 reduce the crude protein content of ASP because the protein is wasted not only the protein
270 dissolved in the husk ash water filtrate but also the protein that forms salt with the filtrate.
271 According to Lošdorfer (2017), the effect of pH is based on the difference in charge of the
272 amino acids that make up the protein, which affects the attraction between protein molecules.

273

274 **Effect of fermentation on crude fiber and crude protein content of fermented banana** 275 **peel (FBP)**

276 The crude fiber content of FBP fermented using EM4 at doses of 0, 15 and 30 ml/100gr with
277 a duration of 0, 6 and 12 days can be seen in Table 5. There was no interaction effect
278 between the dose of EM4 and the duration of fermentation on the crude fiber content of FBP,
279 but the dose of EM4 had a significant effect ($P < 0.05$) on the crude fiber content of FBP.
280 Further test with DMRT showed that the dose of EM4 as much as 15 ml/100 grams of banana
281 peel (B) produced a significantly lower crude fiber content (CF= 13.51%).

282 The decrease in crude fiber content at a dose of 15 ml / 100 grams (B) was 15.54%
283 because at this dose the microbes that digest crude fiber work optimally, one type of
284 microorganism contained in EM4 is bacteria (streptomyces sp) that produce cellulase
285 enzyme. Cellulase enzyme can degrade the crude fiber found in banana peel. During
286 fermentation, the lignocellulose bonds in banana peels are broken because the lignolytic
287 microbes in EM4 help break down the lignocellulose bonds so that cellulose and lignin can
288 be released from these bonds by the lignase enzyme. This causes a decrease in crude fiber
289 content in banana peels fermented with EM4 in treatment B.

290 This research is also in line with the research of Kumar et al. (2020) which states that
291 microbial starters such as EM4 reduce the cell wall content (NDF) of rice straw because
292 during fermentation there is a breaking of the lignocellulosic bonds of rice straw. Lignolytic
293 microbes in EM4 help break down lignocellulose bonds so that cellulose and lignin can be
294 released from these bonds by the lignase enzyme.

295 Banana peel fermented using EM4 at doses of 0, 15 and 30 ml/100gr with fermentation
296 duration of 0, 6 and 12 days produced crude protein content of 8.58% - 11.25% as presented
297 in Table 5. It can be seen that there is no interaction effect of EM4 dose with the duration of
298 fermentation on the crude protein content of FBP, but the duration of fermentation has a very
299 significant effect ($P < 0.01$) on the crude protein content of FBP. After further testing using

300 DMRT, it was found that the length of fermentation of 6 days and 12 days produced a very
301 significant ($P < 0.01$) higher crude protein content in FBP, namely 11.25% and 11.13%.

302 The crude protein content in FBP fermented for 6 days and 12 days increased by 31.12% and
303 29.72%. The high crude protein content in FBP fermented with EM4 for 6 days and 12 days
304 is due to the microbes in EM4 that continue to grow and develop as the fermentation time
305 increases, then the microbes will increase the crude protein content of banana peels because
306 microbes are single cell proteins that increase the crude protein content in FBP.

307 Protein levels in fermentation can increase due to an increase in decomposing microbes that
308 die because they cannot survive in an acidic atmosphere (Sharma 2020). Furthermore, Bhatia
309 (2013) also explained that microbes are single cell proteins so that they can indirectly
310 increase crude protein content.

311 Crude protein content at 0 days of fermentation ($CP = 8.58\%$) was significantly lower
312 because at 0 days the microbes in EM4 had not grown and developed. From the results of this
313 study it was found that the dose of EM4 15 ml/100 grams can reduce crude fiber to 13.50% in
314 FBP and 6 days of fermentation can increase crude protein content to 11.25%.

315 **Trial 2: Nitrogen retention test on best ASP and crude fiber digestibility test on best** 316 **FBP**

317 **Nitrogen retention value of ASP**

318 Nitrogen retention is the amount of nitrogen consumed and can be retained by the
319 body of livestock to be used in the metabolic process so that the greater the nitrogen retention
320 value of a feed ingredient, the better it is for the metabolic process of quail. The amount of
321 nitrogen retained is obtained from the reduction of nitrogen consumed in feed ingredients
322 with the amount of nitrogen excreted through feces and urine.

323 The nitrogen retention value of untreated avocado seed flour and processed avocado
324 seed flour (ASP) in this study can be seen in Fig. 1. The average nitrogen retention value in
325 untreated avocado seed flour (control) is 37.49%, this value is lower than the average
326 nitrogen retention in the best TBAO in phase I research (soaked with 30%) which HAWF)
327 reached 59.09%. After conducting a T test, it was found that the value of N retention in ASP
328 was very significantly higher ($P < 0.01$).

329 The nitrogen retention value of the best ASP increased by 57.62% compared to Avocado
330 seeds without processsing. Nitrogen retention of ASP is higher even though the crude
331 protein content is lower because the tannin content is lower so that the protein bound to the
332 tannin that forms a complex compound is also reduced, this causes the digestibility of ASP
333 protein in quail to increase so that less nitrogen is released through feces and urine. Reduced

334 nitrogen excreted by quail with feces and urine can increase the nitrogen retention value. The
335 level of nitrogen retention depends on the metabolic energy of the ration, protein
336 consumption, protein digestibility coefficient, protein quality, and the balance of amino acids
337 in the ration (Wahju 1997).

338 Conversely, in unprocessed avocado seeds (control) although the protein content is higher
339 than processed avocado seed flour due to the high content of tannins that bind to proteins in
340 avocado seeds so that protein digestibility is reduced which causes the nitrogen retention
341 value to drop. Tannins can suppress nitrogen retention and result in decreased digestibility of
342 amino acids (Calislar 2017). Furthermore, Hassan et al (2020) stated that tannins are
343 polyphenolic compounds that have the ability to precipitate proteins, namely by forming
344 insoluble complexes that can reduce protein digestibility.

345

346

347 **Crude Fiber Digestibility Value of Fermentation banana peel**

348 The crude fiber digestibility values of untreated banana peel flour (BP) and fermented
349 banana peel flour (FBP) can be seen in Figure 2. The best crude fiber digestibility value of
350 FBP in experiment 1 was 25.67%, while that of unfermented banana peel flour (control) was
351 only 5.34%. After T test, it was found that the crude fiber digestibility of fermented banana
352 peel flour (FBP) was significantly higher ($P < 0.01$) than the control.

353 Fermentation of banana peel with EM4 is able to increase the fiber digestibility of banana
354 peel flour almost five times that of banana peel flour without fermentation, this is because
355 during fermentation the enzymes produced by microbes in EM4 can break lignocellulose
356 bonds in banana peel and cellulose is then degraded by cellulase enzymes while lignase will
357 break down lignin.

358 Fiber fractions have been partially broken down by microbes contained in EM4 so that in the
359 digestive process in the quail's body more crude fiber is digested and absorbed, which in turn
360 will increase the digestibility of crude fiber in FBP. According to Dilaga et al. (2022) during
361 the fermentation process there is a breaking of lignocellulose bonds in rice straw.

362 In quail, a high value of crude fiber digestibility is very important in the metabolic process
363 because the digestive process of quail does not produce enzymes that are able to degrade
364 crude fiber, this can be seen with the low value of crude fiber digestibility in banana peel
365 flour without fermentation (control) because the fiber fractions contained in banana peels
366 cannot be broken down in the digestive process.

367 **Trial 3: Ration treatment to livestock**

368 The results of trial 1 showed that avocado seed meal soaked with 30% HAWF produced the
369 lowest tannin content and banana peel flour fermented using EM4 at a dose of 15 ml/100
370 grams with a fermentation duration of 6 days produced the lowest crude fiber content and
371 higher crude protein. The best ASP and FBP need to be tested biologically in the field by
372 using them in the ration composition of laying quail.

373

374 **Effect of ASP and FBP on quail ration consumption.**

375 Ration consumption of quail fed ASP and FBP ranged from 14.08 - 21.65
376 grams/head/day. The results of the analysis of variance showed that the use of ASP and FBP
377 in the ration gave a very significant difference ($P < 0.01$) to the consumption of quail rations.
378 The consumption of treatments C and F were not significantly different from the control (A),
379 this is because the control ration (A) and rations containing 20% FBP (C) and 15% FBP (F)
380 have the same level of palatability so that the ration consumption is also not significantly
381 different. FBP which has a pleasant smell and aroma is favored by quail, so the reduction in
382 the use of corn substituted with FBP 20% and 15% in the ration has no effect on quail ration
383 consumption. According to Canogullari (2016) that consumption is not only influenced by
384 the energy content and food substances of the ration, the health of the livestock, but also by
385 the smell and shape of the ration.

386 Ration consumption of B, D and E was significantly lower than A (control) due to the
387 presence of tannins in ASP which caused a bitter and astringent taste, thus reducing the level
388 of palatability which had an effect on reducing quail ration consumption. In accordance with
389 the opinion of Hassan et al. (2020) which states that the bitter and astringent taste caused by
390 the presence of tannins can cause low chicken consumption.

391

392 **Effect of ASP and FBP in Rations on daily egg production (hen day) of Quail.**

393 The average daily egg production of quail ranged from 5.02% to 51.16%, the results
394 of the analysis of variance showed that the use of ASP and FBP in the ration produced very
395 significant differences ($P < 0.01$) on daily egg production of quail. Quails that consume ration
396 C have daily egg production that is not significantly different from A (control), this is
397 because the consumption of C and A is also not significantly different, so the nutrients
398 consumed for egg production are the same.

399 Daily egg production in quails consuming rations B, D, E and F was significantly different
400 from A (control). The low egg production of B, D, E and F was due to low consumption and

401 the presence of tannin in the ration. Low consumption causes the nutrients consumed to
402 produce are not fulfilled, thus reducing egg production.

403 Daily egg production in A (control) was significantly higher than F although
404 consumption between A and F was not significantly different, it is suspected that there are
405 alkaloids or other compounds in ASP besides tannins that can reduce quail production, one of
406 which is thought to be the high content of triterpenoids. The results of research by Setyawan
407 et al (2021) showed that in addition to tannins, triterpenoids were also found in avocado
408 seeds, furthermore Farmatrade (2023) explained that 0.9% triterpenoids in the diet reduced
409 growth and fat digestibility.

410 Daily egg production of quails consuming ration B was significantly lower than the
411 others due to its very low consumption and high tannin content in the ration, while quails
412 consuming rations D and E had daily egg production that was not significantly different even
413 though the consumption of D was significantly higher ($P<0.05$) than E due to the higher
414 tannin content in D. The daily egg production of quails consuming rations D and E was not
415 significantly different.

416 **Effect of ASP and FBP in Ration on Quail Egg Weight**

417 From the results of this study, quail egg weight ranged from 8.15 grams to 9.35
418 grams. The use of ASP and FBP in quail rations gave a very significantly different effect
419 ($P<0.01$) on quail egg weight. Quail consuming rations C and F had a significantly higher egg
420 weight compared to A (control) while the egg weight of B, D and E were not significantly
421 different from A (control).

422 The higher egg weight in treatments C and F is because at a good consumption level TKPF
423 can slow down sexual maturity so that the age of first laying quail is longer which will result
424 in greater egg weight. According to Revelation (1997) young chickens whose sex maturity is
425 slowed down produce larger eggs than chickens whose sex maturity is not slowed down.

426 Quails consuming rations C and F reached sexual maturity at 52 and 54 days of age, this age
427 of sexual maturity was slower than ration A (control) which reached sexual maturity at 45
428 days. Jaya (2012) reported that quails that are slowed to sexually mature at the age of 50-55
429 days are more profitable because they have a larger egg size, longer production peak, longer
430 production life and decreased mortality.

431 FBP can slow down the sex maturity of quail because FBP has high crude fiber. The nature of
432 fibrous food is bulky so there is a tendency for transit time in the digestive organs to be very
433 short, resulting in a decrease in nutrient absorption (including fat and its components such as
434 cholesterol). As a result of the inhibition of cholesterol absorption, the ovaries are inhibited in

435 synthesizing the hormone estrogen, thus inhibiting the formation of egg follicles which
436 ultimately slows down the age of sexual maturity. One of the roles of cholesterol is as a
437 precursor of several steroid hormones such as estrogen and testosterone (Craig et al. 2023).

438 In treatments B, D and E, very low consumption will cause low protein consumption so that
439 the egg weight is not significantly different from A (control), low protein consumption will
440 result in low yolk weight and egg albumen. According to Shim et al. (2013) that the weight of
441 the yolk and the size of the egg is also influenced by protein consumption, if protein
442 consumption is low it will form yolk and low egg weight.

443 **Effect of ASP and FBP in ration on quail egg mass**

444 The average egg mass produced in the study was 0.42 gr/day to 4.16 gr/hr. Analysis
445 of variance showed that there was a very significant difference ($P < 0.01$) in the effect of the
446 use of ASP and FBP on quail egg mass. Quail consuming rations C and F had egg masses
447 that were not significantly different from A (control), while quail consuming rations B, D and
448 E had egg masses that were significantly lower than A (control).

449 The fact that treatments C and F did not differ from A (control) was influenced by egg
450 production and egg weight. In quail that consumed ration C had the same egg production as
451 A (control), while in treatment F although the egg production was lower than A (control) but
452 because the egg weight was higher than A which ultimately resulted in egg mass that was not
453 significantly different from A (control). Egg mass is highly dependent on egg weight and
454 daily egg production because egg mass is obtained from the multiplication of egg weight with
455 daily egg production. According Shim et al. (2013) egg mass is closely related to egg weight
456 and egg production produced.

457 In Table 11 it can also be seen that the egg mass in quails consuming rations B, D and E is
458 very significantly lower ($P < 0.01$) than A (control), this is due to egg weight and daily egg
459 production which is also significantly lower than A. Likewise, quail consuming ration D had
460 an egg mass that was very significantly ($P < 0.01$) lower than A, C, and F but very
461 significantly higher than B and E, this was also due to the daily egg production produced in D
462 which was also very significantly lower ($P < 0.01$) than A, C and F and very significantly
463 higher than B and E.

464 **Effect of Using ASP and FBP in Ration on Ration Conversion of Quail**

465 The lower the ration conversion rate, the more efficient the amount of feed
466 consumed in producing eggs. Ration conversion is obtained from the quotient of the amount
467 of feed consumed with egg mass. The average ration conversion value as shown in Table 11

468 is 5.32 - 35.51. From the results of the analysis of variance, there was a very significant
469 difference ($P < 0.01$) due to the use of ASP and FBP in quail rations on ration conversion.

470 Quail that consumed rations C, D and F ration conversion was not significantly different from
471 A (control), this is due to ration consumption and egg mass resulting in the same ration
472 conversion. In treatment D, although the ration conversion was not significantly different
473 from A (control), the conversion rate tended to be higher because the egg mass was very
474 significantly lower than A. The ration conversion of B and E was very significantly higher
475 than A (control) because the egg mass was very significantly lower, resulting in a large
476 conversion rate.

477 The ration conversion rate in B is very significantly greater ($P < 0.01$) which reached 35.51
478 due to very low daily egg production which is only 5% so that the egg mass is also very
479 small, although the ration consumption of B is very significantly lower but because the
480 production is very small resulting in a very large ration conversion rate. According to Rasyaf
481 (1995) ration conversion is the ratio between the amount of ration consumed compared to the
482 amount of egg production in a certain unit of time.

483 From this study, it can be seen that the use of ASP at the level of 15% (E) and 20% (B) in
484 quail rations is inefficient, this is indicated by the very large conversion rate. The use of FBP
485 up to the level of 20% (C) in the quail ration is efficient because it produces conversion rates
486 that are not significantly different from the control ration.

487 **Effect of ASP and FBP in ration on quail yolk color**

488 The higher the yolk score value, the better because the yolk color is more yellow. The
489 results of the analysis of variance showed that the use of ASP and FBP in quail rations
490 produced very significant differences ($P < 0.01$) on the yolk color index. After further testing
491 with DMRT, it was found that the yellow color index in B, C, D, E and F was significantly
492 higher than A (control).

493 The high yolk color index in rations containing ASP and FBP (A, B, C, D, E and F) is
494 due to the high content of vitamin A or carotene in ASP which reaches 27.2 IU/g and the
495 content of β -carotene in FBP which is 45 mg/100 g. This can increase the amount of carotene
496 pigments in the yolk thus increasing the yolk color index in quail eggs. This can increase the
497 amount of carotene pigment in the egg yolk, thus increasing the yellow color index in quail
498 eggs. According to Kljak et al. (2021), egg yolk color is closely related to the vitamin A
499 content in the ration, the higher the vitamin A consumed, the carotene pigment and egg yolk
500 color will also increase.

501 The high content of β -carotene in FBP also causes an increase in the yolk color index.
502 According to Hausman & Sandman (2000), β carotene is an unstable carotenoid compound
503 because it is easily oxidized into xanthophyll. Xanthophyll functions for yolk coloration.
504 Xanthophyll cannot be synthesized by the chicken body, but is obtained from a ration
505 consisting of feed ingredients containing xanthophyll.

506 The higher the yolk index value, the more favorable it is to consumers. From the
507 results of this study, the yolk color index value of quail fed the treatment rations (B, C, D, E
508 and F) ranged from 7.3 to 8.2, this value was higher than the yolk color index value of quail
509 fed the control ration (A) which was only 5.8. The yolk color index value of eggs fed with
510 ASP and FBP in the diet was higher than the yolk index value of quail eggs in general. From
511 the results of previous research conducted by Sestilawati (2011), the yolk color index only
512 ranged from 5.78 to 6.42.

513 The results of phase III of this study showed that the use of 20% ASP (ration C) or
514 5%ASP + 15% (ration F) in the ration of laying quail can reduce the use of corn by 44% with
515 better performance and egg quality.

516

517 **Conclusion**

518 Processing avocado seeds through soaking with 30% husk ash water filtrate (HAWF) for 48
519 hours can reduce tannin content in seeds by 42.86%, but crude protein content decreased by
520 37.53% and increased nitrogen retention by 57.62%. Fermentation of banana peel using EM4
521 at a dose of 15 ml/100 g and fermentation duration of 6 days can reduce 15.54% of crude
522 fiber content and increase crude protein content by 31.12% and increase crude fiber
523 digestibility by 380%. The rations that gave the best response on performance and egg quality
524 were rations C (20% FBP) and F (5%ASP + 15%FBP), which could reduce the use of corn
525 by 44%.

526 **Acknowledgment**

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528 University of Andalas, which has facilitated laboratory testing.

529 **Author's Contribution**

530 Ade djulardi was in charge to supervise the experiment and writing the original script. Hera
531 dwi triani and Ahadiyah yuniza conducted the experiment, analyzed the data and finalize
532 manuscript.

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Tabel 1: Feed ingredients composition (%) in the treatment

Ingredients of feed (%)	Treatment ration					
	A	B	C	D	E	F
Corn	42	21.5	23.5	21.5	21.5	23.5
Rice brand	15	15	13	15	15	13
Soybean meal	20	20	20	20	20	20
Fishmeal	15	15	15	15	15	15
ASP	-	20	-	10	15	5
FBP	-	-	20	10	5	15
Coconut oil	3.5	4	4	4	4	4
Rock flour	4	4	4	4	4	4
Topmix	0.5	0.5	0.5	0.5	0.5	0.5
Total	100	100	100	100	100	100

Table 2: Nutritional content (%) and metabolic energy (kcal/kg) of the treatment ration

Food substances	Treatment ration					
	A	B	C	D	E	F
EM	2844.4	2830.4	2834.0	2817.2	2823.6	2835.9
Crude protein	20.27	20.01	20.33	20.31	20.07	20.26

Crude fiber	4.22	4.75	6.33	5.65	5.19	5.90
Crude Lipid	6.02	7.83	7.32	7.50	7.64	7.42
Ca	2.58	2.56	2.67	2.63	2.59	2.63
P	0.81	0.83	0.86	0.85	0.84	0.85

645

646 Table 3. Effect of processing on tannin and crude protein content of avocado seeds

Parameters (%)	Perlakuan				
	A1	A2	A3	A4	SE
Tanin	1.30 ^a	1,45 ^a	1,24 ^a	0,84 ^b	0,07
Crude protein	7.01 ^b	8,18 ^a	8,29 ^a	6,47 ^b	0,37

647 **What do you mean by superscripts? Difference in row or column?**

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649 Table 4. Crude fiber Content of fermented banana peel

Dose (ml/100g)	Fermentation time (da)			
	0	6	12	Average
..... %				
A = 0	14.19	15,32	17,30	15,61 ^a
B = 15	12,9	14,47	13,24	13,51 ^b
C = 30	14,03	15,22	16,85	15,37 ^a
Average	13,67	15,00	15,8	
SE	0,59			

650 Different superscripts in the same column indicate significantly different (P<0.05).

651 SE = Standar Error

652 Before processing CF content = 15.61%

653

654 Table 5. Crude protein content of fermented banana peel

Dose (ml/100g)	Fermentation time (day)			
	0	6	12	Average
..... %				
A = 0	8,38	11,38	12,12	10,63
B = 15	8,95	11,63	10,32	10,30
C = 30	8,40	10,73	10,93	10,02

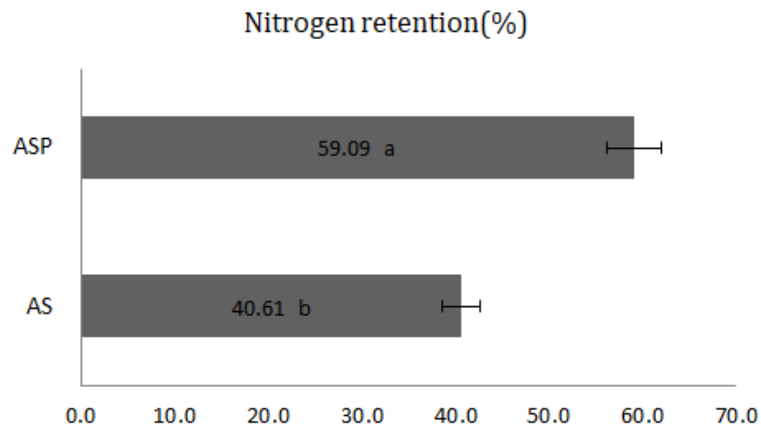
Average	8,58 ^a	11,25 ^b	11,13 ^b
SE	0,28		

655 Different superscripts on the same line indicate significantly different (P<0.01)

656 SE = Standard Error

657 Before processing, crude protein content was 8.58%

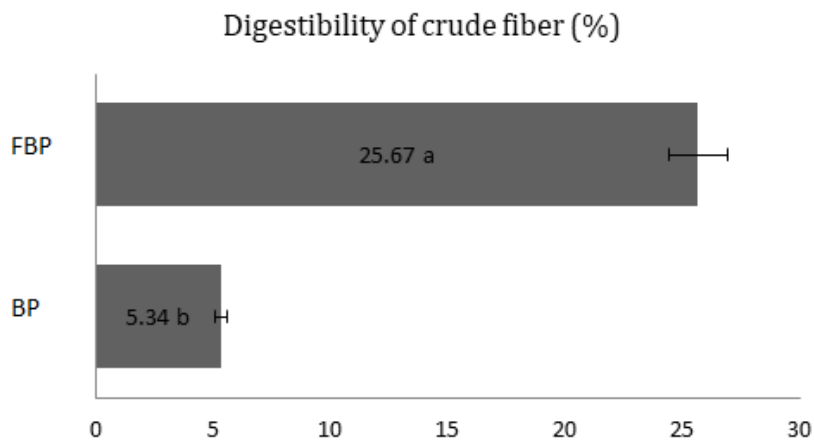
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660 **Fig. 1:** Nitrogen retention of Avocado Seeds Processing (ASP). **Bar should be in light color**
 661 **so that reading become clear**

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664 **Figure 2.** Crude fiber digestibility of Fermentation Banana Peel (FBP)

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670 Table. 6. Average Consumption, Daily Egg Production, Egg Weight, Egg Period, Ration
 671 Conversion and Yolk Color Index During the Study

Parameter	Treatmen						SE
	A	B	C	D	E	F	
Ration consumption (g/head/day)	21,44 ^a	14,08 ^c	21,20 ^{ab}	19,90 ^b	15,45 ^c	21,65 ^a	0,46
Egg production (%)	51,16 ^a	5,02 ^d	43,04 ^{ab}	22,38 ^c	9,69 ^d	37,59 ^b	3,32
Egg weight (g/grain)	8,15 ^b	8,38 ^b	9,35 ^a	8,62 ^b	8,27 ^b	9,29 ^a	0,22
Egg mass (g/head/hr)	4,16 ^a	0,42 ^c	4,02 ^a	1,93 ^b	0,79 ^c	3,49 ^a	0,27
Ration conversion	5,32 ^a	35,51 ^c	5,66 ^a	10,76 ^a	23,50 ^b	6,30 ^a	3,16
Yolk color	5,50 ^b	7,50 ^a	7,25 ^a	7,50 ^a	7,84 ^a	8,17 ^a	0,40

672 Note: different superscripts on the same line indicate significantly different (P<0.05) and
 673 significantly different (P<0.01).

674 SE = Standard Error

675 To write fraction of a reading, use “.” NOT the “,”

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I am interested in sending a journal to the international journal of veterinary science (IJVS). This manuscript examines the processing of avocado seeds and banana peels used as quail feed. This research consists of 3 stages, namely: processing of avocado seeds and banana peels to reduce tannins and reduce crude fiber, biological tests to see the digestibility of protein and crude fiber and application of rations to quails Coturnix-coturnix japonica.



The novelty in this research

The research was the combination of avocado seeds and banana peels processed into rations is one of the alternative breakthroughs in quail ration ingredients to replace the use of corn by utilizing agricultural waste so that it can also reduce feed costs.

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Ade Djulardi <djulardi24@gmail.com>
Kepada: "gusriyanti594@gmail.com" <gusriyanti594@gmail.com>

17 Mei 2023 pukul 10.35

[Kutipan teks disembunyikan]


 **IJVS 23-185 for Review.docx**
296K


Ade Djulardi <djulardi24@gmail.com>
Kepada: gusriyanti594@gmail.com

1 November 2023 pukul 08.12

[Kutipan teks disembunyikan]

2 lampiran

 **List of Potential Reviewers.docx**
17K

 **Manuscript Dr. Ade Djulardi.docx**
301K

Ade Djulardi <djulardi24@gmail.com>
Kepada: gusriyanti594@gmail.com

28 Januari 2024 pukul 19.32

Forwarded Conversation
Subject: Manuscript Ade Djulardi

Dari: **Ade Djulardi** <djulardi24@gmail.com>
Date: Min, 23 Apr 2023 pukul 10.59
To: <editor@ijvets.com>

dear editors

I am interested in sending a journal to the international journal of veterinary science (IJVS). This manuscript examines the processing of avocado seeds and banana peels used as quail feed. This research consists of 3 stages, namely: processing of avocado seeds and banana peels to reduce tannins and reduce crude fiber, biological tests to see the digestibility of protein and crude fiber and application of rations to quails Coturnix-coturnix japonica.

The novelty in this research

The research was the combination of avocado seeds and banana peels processed into rations is one of the alternative breakthroughs in quail ration ingredients to replace the use of corn by utilizing agricultural waste so that it can also reduce feed costs.

I hope this journal can be considered to be reviewed, Thank you

Best regards

Ade Djulardi

Dari: **Editor IJVS** <editor@ijvets.com>
Date: Sen, 24 Apr 2023 pukul 00.31
To: Ade Djulardi <djulardi24@gmail.com>

Dear Author,

Thank you very much for showing interest in our journal "International Journal of Veterinary Science" (<https://www.ijvets.com/>; Scopus Indexed: Q2). Your submission has been acknowledged and allotted **Manuscript No. IJVS-23-185. Please mention this allotted manuscript number in all-future correspondence related to this paper.** Author(s) has to pay Article Publishing Charges (APCs) (**US\$300 up to 6 Printed Pages, and Over and above 06 printed pages: US\$ 30/Printed page**) after acceptance of their manuscript*, **. If you agree to pay APCs, we can process further for your submitted manuscript. **A signed Copyright Release Form is mandatory for processing of the manuscript, this form is available at <https://www.ijvets.com/instructions-2/>.**

***APCs for normal processing (8-10 weeks)**

****APCs for fast track (2-4 weeks): (US\$400 up to 6 Printed Pages, and Over and above 06 printed pages: US\$ 30/Printed page)**

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With Best Regards

PROF. DR. AHRAR KHAN
Editor-in-Chief
International Journal of Veterinary Science
<https://www.ijvets.com/>

Dari: **Ade Djulardi** <djulardi24@gmail.com>
Date: Sel, 25 Apr 2023 pukul 19.21
To: Editor IJVS <editor@ijvets.com>

Dear editor

Here i attach the copyright release form and I need fast-track processing.

I hope you can evaluate my article for further process.

Im looking forward to hearing from you soon.
Thank you for your consideration

Best regards,
Ade Djulardi

Dari: **Editor IJVS** <editor@ijvets.com>
Date: Sel, 16 Mei 2023 pukul 13.23
To: Ade Djulardi <djulardi24@gmail.com>

Dear Author,





Please refer to your manuscript submitted to the "International Journal of Veterinary Science" for possible publication.

Your submitted manuscript has been reviewed, and the comments of the Reviewer/Editor(s) are attached herewith or present in the manuscript file. Please revise your manuscript; whatever you revise must be shown in **Blue colored font**. **It is mandatory to revise the paper (word file) sent along with this email as the editorial office has made formatting and other editorial changes.** Now you will be supplying us within **05-days** two files, i.e., File 1) Revised Paper naming as **IVJS-23-185-Rev-1 (A clear file without track changes)**, **BUT changes must appear in the Blue colored font** and File 2) checklist of how you dealt with the points raised by the Reviewer/Editor (s).

Dari: **Ade Djulardi** <djulardi24@gmail.com>
Date: Rab, 17 Mei 2023 pukul 11.35
To: gusriyanti594@gmail.com <gusriyanti594@gmail.com>

Dari: **Ade Djulardi** <djulardi24@gmail.com>
Date: Rab, 1 Nov 2023 pukul 09.12
To: <gusriyanti594@gmail.com>

4 lampiran

-  **List of Potential Reviewers.docx**
17K
-  **Manuscript Dr. Ade Djulardi.docx**
301K
-  **Ade djulardi form.pdf**
176K
-  **IJVS 23-185 for Review.docx**
296K

Ade Djulardi <djulardi24@gmail.com>
Kepada: gusriyanti594@gmail.com

19 Maret 2024 pukul 09.13

----- Forwarded message -----
Dari: **Editor IJVS** <editor@ijvets.com>
Date: Sel, 16 Mei 2023 pukul 13.23
Subject: Re: Manuscript Ade Djulardi
To: Ade Djulardi <djulardi24@gmail.com>

[Kutipan teks disembunyikan]

-
-  **IJVS 23-185 for Review.docx**
296K



Ade Djulardi <djulardi24@gmail.com>

IJVS 23-185-Rev-1

15 pesan


Ade Djulardi <djulardi24@gmail.com>
Kepada: Editor IJVS <editor@ijvets.com>

21 Mei 2023 pukul 18.07

Dear Editor

Here I attach the revision of my article.
I hope you can evaluated my article for further process
I look forward to hearing from you soon
thank you for your consideration.

Best regards
Ade Djulardi

2 lampiran **IJVS 23-185-Rev-1.docx**
75K **Our Corrections IJVS 23-185-Rev-1.docx**
15K

Editor IJVS <editor@ijvets.com>
Kepada: Ade Djulardi <djulardi24@gmail.com>

23 Mei 2023 pukul 12.40


Dear Author,

During the final checking, we found you mentioned Table 8 and Table 11 in the text.
But these tables are missing. Correct these. Name the file as IJVS-23-185-Rev-2.

[Kutipan teks disembunyikan]

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With Best Regards

PROF. DR. AHRAR KHAN
Editor-in-Chief
International Journal of Veterinary Science
<https://www.ijvets.com/>

 **IJVS 23-185-Rev-1.docx**
67K

Ade Djulardi <djulardi24@gmail.com>
Kepada: Editor IJVS <editor@ijvets.com>


24 Mei 2023 pukul 13.48

Dear Editor,

Here we send the latest revision of our manuscript as instructed.

Best regards,

Ade Djulardi
[Kutipan teks disembunyikan]

 **IJVS 23-185-Rev-2.docx**
77K

Editor IJVS <editor@ijvets.com>
Kepada: Ade Djulardi <djulardi24@gmail.com>

24 Mei 2023 pukul 15.40

It is too late now; as your manuscript has already gone to the reviewer.

[Kutipan teks disembunyikan]

Editor IJVS <editor@ijvets.com>
Kepada: Ade Djulardi <djulardi24@gmail.com>

7 Juni 2023 pukul 05.26

Dear Author,

Your revised manuscript (**IJVS-23-185**) has been found acceptable after processing. Article Publishing Charges (APCs) are i) up to 6 Printed Pages on Fast Track: US\$400; ii) Over and above 06 printed pages: US\$ 30/Printed page. Your paper is composed of 09 pages; therefore, you are requested to pay **US\$490** as APCs through **"MoneyGram" OR "Ria"** using the recipient's name as MUHAMMAD ZAFAR IQBAL, city: FAISALABAD, country: PAKISTAN as early as possible so that your paper be sent for publishing and other processes. You will be sending us the receipt issued by the money-sending office and the first and last name of the sender, along with the country name from where the money was sent.

[Kutipan teks disembunyikan]

Ade Djulardi <djulardi24@gmail.com>
Kepada: Editor IJVS <editor@ijvets.com>

7 Juni 2023 pukul 07.15

Dear Editor,

can we make payments via Paypal? because here for bank transfers, money grams and Ria are quite difficult.

Best regards
Ade Djulardi

[Kutipan teks disembunyikan]

Editor IJVS <editor@ijvets.com>
Kepada: Ade Djulardi <djulardi24@gmail.com>

7 Juni 2023 pukul 16.43

Dear Author,

You will receive an invoice for PayPal of US\$512 (APCs 490 + 22 PayPal fee).

[Kutipan teks disembunyikan]

Ade Djulardi <djulardi24@gmail.com>
Kepada: Editor IJVS <editor@ijvets.com>

8 Juni 2023 pukul 06.11

Dear Editor

Ok, please send me an invoice.


Best regards
Ade Djulardi

[Kutipan teks disembunyikan]

Editor IJVS <editor@ijvets.com>
Kepada: Ade Djulardi <djulardi24@gmail.com>

8 Juni 2023 pukul 06.48


[Kutipan teks disembunyikan]

 **Invoice - 0020 (1).pdf**
180K

Ade Djulardi <djulardi24@gmail.com>
Kepada: gusriyanti594@gmail.com

8 Juni 2023 pukul 07.52

[Kutipan teks disembunyikan]

 **Invoice - 0020 (1).pdf**
180K

Editor IJVS <editor@ijvets.com>
Kepada: Ade Djulardi <djulardi24@gmail.com>

8 Juni 2023 pukul 15.58

Dear Author,

Thank you very much for choosing the International Journal of Veterinary Science (<https://www.ijvets.com/>) for your valuable publication. Now your paper has been composed, please perform proofreading within 1-2 days and indicate mistakes in a Table form, and name the file

as Corrections-IJVS-23-Your Paper #


Page #	Line #	Column 1 or 2	In Proofs	What change required

If you don't find any mistakes, even then inform us.

Red font references in the text or list are missing if any. You'll need to provide the missing references, and if present in the list, then cite these references in the text or delete them.

Thank you very much again for your valuable contribution. We are excited to receive your new research/review article soon.

[Kutipan teks disembunyikan]

 **IJVS 23-185-9 Indonesia.pdf**
335K

Ade Djulardi <djulardi24@gmail.com>
Kepada: Editor IJVS <editor@ijvets.com>

8 Juni 2023 pukul 16.14

Dear Editor

We hereby send you proof of payment for the article.

When will our article be published?

can it be within 2 months. we need this article published, because this will be used for the administration of rank on campus.


please help

Thank you

Best regards

Ade Djulardi

[Kutipan teks disembunyikan]

 **Invoice - 0020.pdf**
197K

Editor IJVS <editor@ijvets.com>
Kepada: Ade Djulardi <djulardi24@gmail.com>

8 Juni 2023 pukul 19.06

Dear Author,

Yes, we received the payment and sent you proofs for reading. Your paper will go online promptly.

[Kutipan teks disembunyikan]

Ade Djulardi <djulardi24@gmail.com>
Kepada: Editor IJVS <editor@ijvets.com>

9 Juni 2023 pukul 11.17

Dear Editor

We hereby submit the corrected article.

Best regards

Ade djulardi

[Kutipan teks disembunyikan]

 **Corrections-IJVS-23.docx**
14K

Ade Djulardi <djulardi24@gmail.com>
Kepada: Editor IJVS <editor@ijvets.com>

9 Juni 2023 pukul 13.10

Dear Editor

I would like to know if you can possibly help me so that my manuscript can be published in Volume 12 no. 4 (2023)? I need it to complete the administrative affair in my university that will be due in 2 months. This manuscript need to be displayed in scopus so i wonder if you can help me with this matter. Should it cost some addition payment, i will probably agree with that. I do hope that you can lend me a hand with this manuscript.

Best regards,

Ade djulardi

[Kutipan teks disembunyikan]