

# Effect of dietary fermented and unfermented grape skin on broiler chickens

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## INTRODUCTION

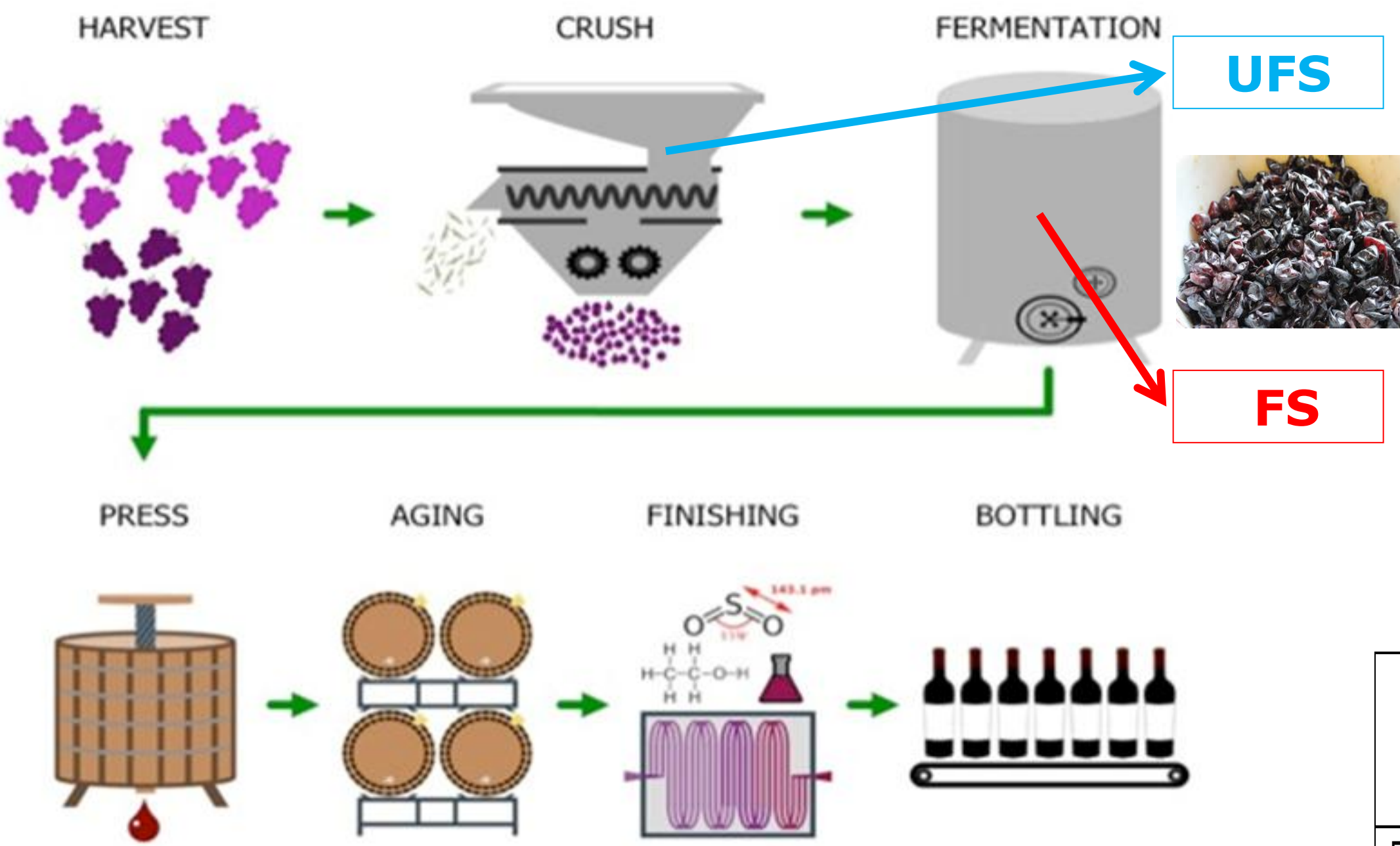
Grape skin is a source of polyphenols with antioxidant and antimicrobial properties. Little information is available regarding its application in animal feeds. Vitamin E is the antioxidant most commonly used in animal nutrition, but it presents some drawbacks. Previous studies showed an increase in the antioxidant activity of broiler diet, excreta, and meat as a result of the dietary administration of grape pomace (GP). However, there is no information about the effect of grape skin (a main component of GP) and particularly, if the separation of skins from juice before fermentation (unfermented skins) or after (fermented skins) in the wine making process has some effect in their composition and on the antioxidant effect in chickens fed these ingredients.

## OBJECTIVE

We investigate the effect of the inclusion of fermented (FS) and unfermented (UFS) grape skin at different doses (30 g/Kg and 60 g/kg) and of Vitamin E (α-tocopheryl acetate) in broilers chickens fed a corn-soybean diet. Performance, protein and total extractable polyphenols digestibility, intestinal microbiota and oxidative stability of thigh meat after the sacrifice were determined in 21-day-old chickens.

## MATERIALS & METHODS

### Wine making process & Grape Skin



Item	g/100g of Dry Matter	
	FS	UFS
Crude fiber	14.4 ± 1.9	12.2 ± 0.4
Protein	16.30 ± 0.0	10.00 ± 0.1
Total extractable polyphenols (Gallic acid equivalents)	2.30 ± 0.1	6.56 ± 0.2
Condensed tannins (Cyanidin equivalents)	1.24 ± 0.2	0.61 ± 0.1

### Animals & Diets

- ✓ 25 birds/experimental diet.
- ✓ 6 replicates/diet (5 birds/replicate)
- ✓ Experimental period: 21 days (from 1 to 21 day old)
- ✓ Control diet: corn/soy/sunflower oil

### Dietary treatments:

	Control (C)	C + VitE	C + FS30	C + FS60	C + UFS30	C + UFS60
Fermented grape skin, g/kg	0	0	30	60	0	0
Unfermented grape skin, g/kg	0	0	0	0	30	60
Vitamin E, ppm	0	200	0	0	0	0
Crude fiber, g/kg	45	45	44	44	44	43
Straw, g/kg	50	50	40	30	38.7	27.5
Celite <sup>*</sup> , g/kg	10	10	10	10	10	10

\*Celite is a source of acid insoluble ash

### Analysis

**Crude fiber, crude protein (CP) and condensed tannins determination:** in FS, UFS, diet, ileal digesta.

**Extractable polyphenols (EP) determination:** in FS and UFS, ileal digesta and excreta.

**Ileal and excreta protein and polyphenols digestibility.**

**Microbiological analysis of intestinal content:** at 21 days of chicken age (Lactic acid bacteria, *E. Coli*, *Clostridium*).

**Lipid oxidation of thigh meat:** Thiobarbituric acid reacting substances (TBARS) after 1 and 7 days of thigh refrigerated storage.

## RESULTS

Table 1. Growth performance

	Daily weight gain (g/d)	Daily feed intake (g/d)	Feed conversion ratio
Control	38.6 <sup>a</sup>	51.2	1.33 <sup>b</sup>
Control + VitE	40.2 <sup>a</sup>	54.4	1.35 <sup>b</sup>
Control + FS30	38.3 <sup>ab</sup>	53.3	1.40 <sup>ab</sup>
Control + FS60	34.3 <sup>b</sup>	51.6	1.51 <sup>a</sup>
Control + UFS30	37.1 <sup>ab</sup>	55.2	1.49 <sup>a</sup>
Control + UFS60	34.5 <sup>b</sup>	51.8	1.50 <sup>a</sup>
SEM	1.28	1.23	0.038
P-value	<0.05	ns	<0.01

Diets with the highest concentration (>30g/kg) of both FS and UFS negatively affected growth performance, with a worse effect in the case of UFS (Table 1).

Table 2. Protein & EP digestibility

Dietary treatments	Ileal protein digestibility (%)	Ileal total extractable polyphenols digestibility (%)	Excreta total extractable polyphenols digestibility (%)
Control	80.3 <sup>a</sup>	40.9 <sup>b</sup>	51.2 <sup>c</sup>
Control + VitE	78.7 <sup>a</sup>	39.9 <sup>b</sup>	63.4 <sup>ab</sup>
Control + FS30	77.6 <sup>ab</sup>	37.5 <sup>b</sup>	57.4 <sup>bc</sup>
Control + FS60	78.3 <sup>a</sup>	41.7 <sup>b</sup>	55.7 <sup>bc</sup>
Control + UFS30	79.6 <sup>a</sup>	51.6 <sup>a</sup>	68.8 <sup>a</sup>
Control + UFS60	74.7 <sup>b</sup>	37.3 <sup>b</sup>	62.6 <sup>ab</sup>
SEM	1.10	2.31	2.30
P-value	<0.01	<0.01	<0.001

Ileal protein digestibility was reduced in birds fed UFS60 (Table 2). Total extractable polyphenols digestibility was higher in birds fed UFS (Table 2).

Table 3. Intestinal microbiota

Dietary treatments	Lactic acid bacteria (log cfu/g)	Escherichia coli (log cfu/g)	Clostridium (log cfu/g)
Control	7.72	6.75	6.54
Control + Vitamin E	6.51	6.22	6.08
Control + FS30	7.42	7.10	6.73
Control + FS60	7.96	5.60	6.39
Control + UFS30	8.35	6.96	8.03
Control + UFS60	8.53	7.99	7.26
SEM	0.632	0.486	0.653
P-value	ns	ns	ns

Intestinal microbiota was not affected by dietary treatment (Table 3).

Table 4. Lipid oxidation of meat

Dietary treatments	MDA (ng/g meat)	
	1 d	7 d
Control	3.96 <sup>a</sup>	18.8 <sup>ab</sup>
Control + VitE	2.52 <sup>b</sup>	4.20 <sup>c</sup>
Control + FS30	3.39 <sup>a</sup>	13.9 <sup>b</sup>
Control + FS60	3.83 <sup>a</sup>	13.3 <sup>b</sup>
Control + UFS30	4.95 <sup>a</sup>	21.4 <sup>a</sup>
Control + UFS60	4.05 <sup>a</sup>	16.6 <sup>ab</sup>
SEM	0.509	3.40
P-value	<0.01	<0.01

Dietary grape skin did not exhibit any protective effect on meat lipid oxidation. The antioxidant potential of FS and UFS grape skin was not effective as vitamin E (Table 4).

## CONCLUSIONS

The dietary addition of grape skin (fermented or unfermented) did not affect oxidative stability of thigh meat and the intestinal microbiota of chickens. High (60 g/kg) concentration of FS and UFS had adverse effect on growth performance and protein digestibility.