

Effect of condensed tannins as antimicrobial agents against pathogenic bacteria in poultry

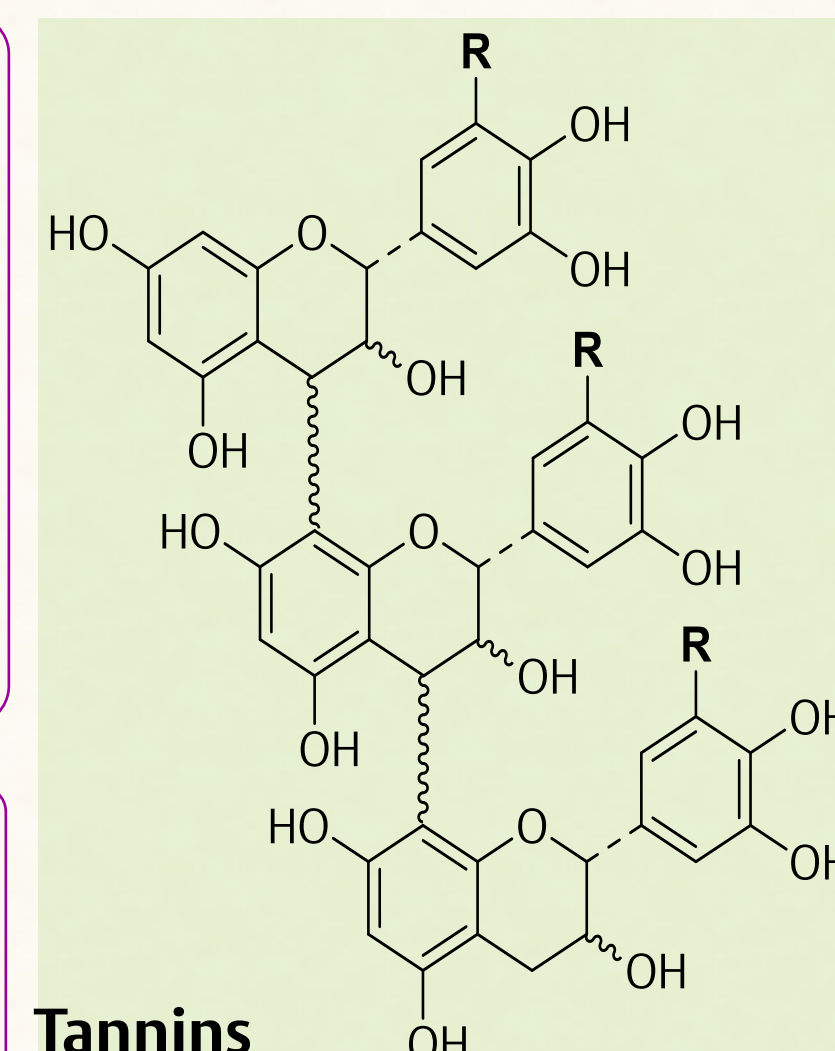
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Introduction:

Plants contain an abundance of natural substances that hold promise as feed additives. Tannins are an important group of such plant compounds. Tannins can form complexes with proteins and other components that, depending upon their chemical structures, can alter their activities. Recently, condensed tannins have shown toxicity against several gastrointestinal parasites.

Aims: 1) To investigate the antimicrobial effects of different plant tannins against Gram-negative and Gram-positive bacteria. 2) To isolate different tannins with a wide range of procyanidins (PC), prodelphinidins (PD) and also mean degrees of polymerisation (mDP).



R = H : Procyanidins (PC)
R = OH: Prodelphinidins (PD)

Materials and Methods: The minimum inhibitory concentrations (MIC) of tannin extracts were determined with agar diffusion and broth microdilution methods against two pathogenic model bacteria, Gram-negative (*Escherichia coli*) and Gram-positive (*Staphylococcus epidermidis*).

Results:

MIC-values for *E. coli* ranged from 5.0 to 10.0 mg/ml:

$$\text{MIC} = 7.83 - 0.59 \text{ mDP} + 0.047 \text{ PC} \quad (P=0.005).$$

MIC-values for *S. epiderdimis* ranged from 1.25 to 5.0 mg/ml:

$$\text{MIC} = 2.72 - 0.31 \text{ mDP} + 0.038 \text{ PC} \quad (P=0.001).$$

Table 1: MIC results for tannin extracts

Tannin sources	*Fractions	PC%	mDP	MIC (mg/ml)	
				<i>E. coli</i>	<i>S. epidermidis</i>
Bracken	F1	100:0	7	10	5
Tilia flower	F2	96:4	9	5	1.25
London plane	F2	55:45	8	5	2.5
Yew	F1	55:45	2	10	5
Hazel	F2	20:80	7	5	1.25
Black locust	F1	15:85	5	5	2.5

* Fractions: F1= 30 % acetone/water (v/v); F2= 80 % acetone/water (v/v)

Figure1: Broth microdilution (96 well plates- flat bottom)

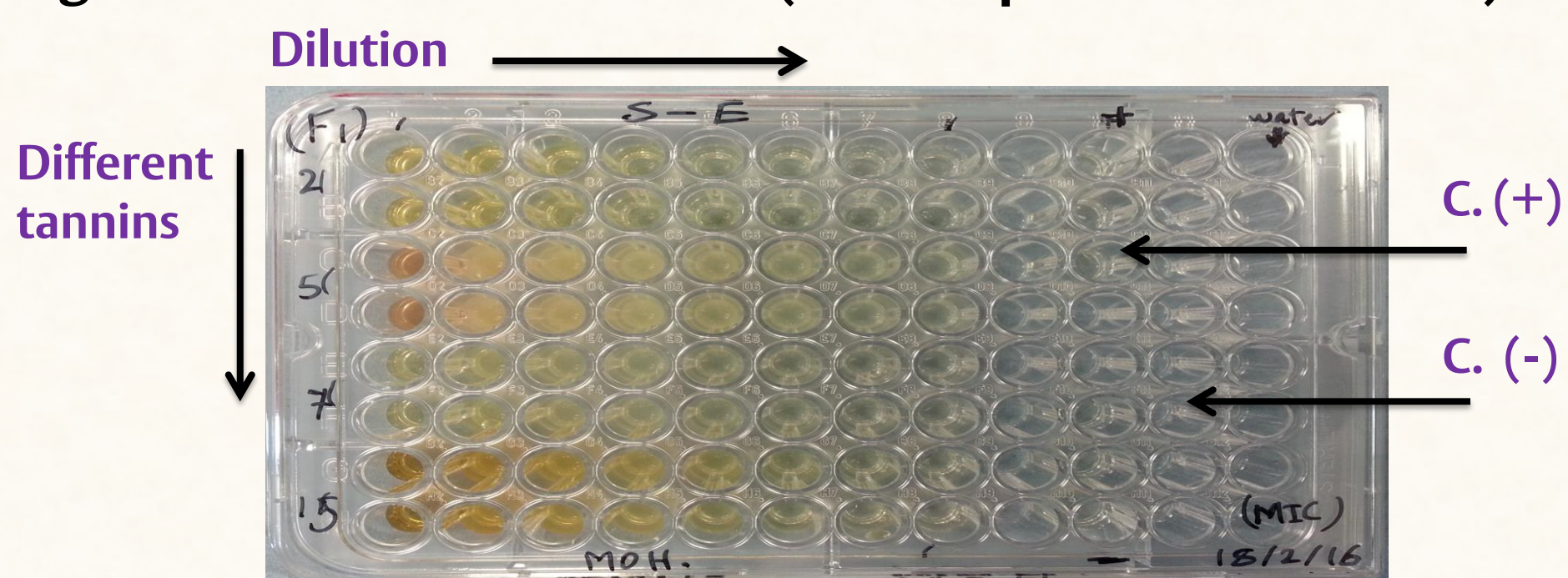
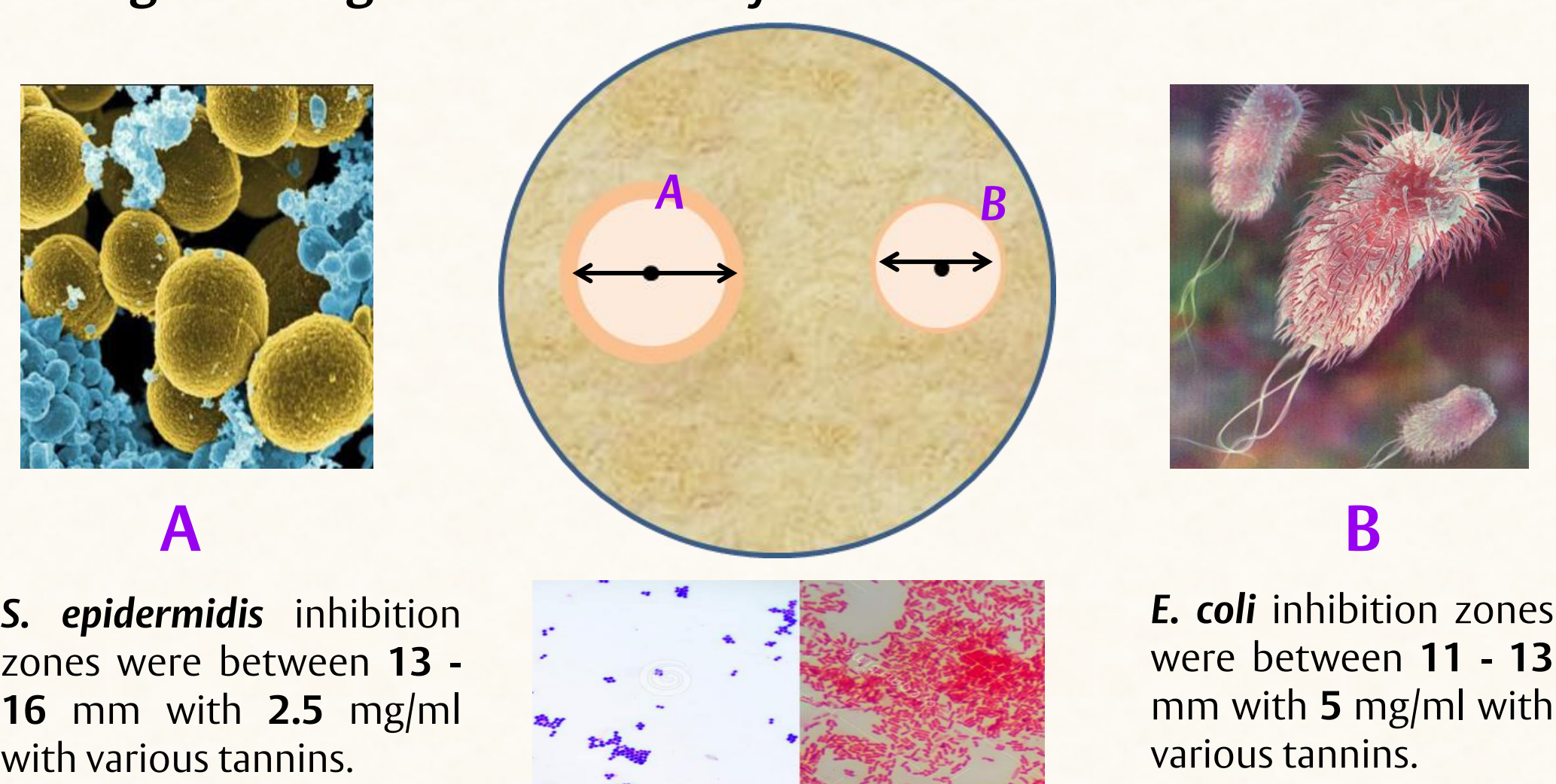


Figure 2: Agar diffusion assay with Luria-Bertani media



Conclusions:

- PD-tannins have greater antimicrobial activity than PC-tannins.
- Gram-positive bacteria may be more susceptible to tannins than Gram-negative bacteria.

Significance and Impact of this Study:

- These plants or extracts may find use as feed supplements or additives in animal diets .

Future Plans:

- Examination of these extracts *in vitro* to determine effects on fermentation and metabolism.

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