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# Growth performance and oxidative status in piglets supplemented with verbascoside and teupolioside

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**ABSTRACT:** Two hundred forty piglets, half female and half barrows,  $8.1 \pm 1.40$  kg LW, were divided into 6 experimental groups and fed *ad libitum* with a diet supplemented with the following levels of antioxidants: 0 (CON + = positive control added with 100 mg lincomicine/kg), 5 (LT = low teupolioside or LV = low verbascoside), 10 (HT = high teupolioside; HV = high verbascoside; LT+LV) mg/kg of diet for 56 days. Body weight and feed intake were recorded on d0, 14 and 56 of the trial. Ten piglets from each group were selected and blood collected by anterior vena cava puncture at 0, 14 and 56 d for reactive oxygen metabolite (ROMs) determination. HV showed final weight higher than the other groups ( $P < 0.05$ ), and oxidative stability was improved by both integrations of verbascoside. These results support the view that Verbascoside influences the growth performances and oxidative status of piglets.

**Key words:** Piglet, Teupolioside, Verbascoside, Oxidative status.

**INTRODUCTION** - Since antiquity herbs and their extracts are utilized for therapeutic purpose. Beneficial effects of herbs or botanicals in farm animals may arise from activation of feed intake and secretion of digestive secretions, immune stimulation, anti-bacterial, coccidiostatic, antihelmintic, antiviral or anti-inflammatory activity and inhibition or antioxidant properties (Wenk, 2003). The current evidence for protective effects of polyphenols against diseases has generate new expectations for improvement in health (Scalbert *et al.*, 2005). Verbascoside and teupolioside are two phenylpropanoides including two polyphenolic rings and two (verbascoside) or three (teupolioside) carbohydrates connected into an olisaccaride chain. These phenylpropanoides have interesting antioxidant effect *in vitro* and in laboratory animals.

Aim of this work was to evaluate the effects of verbascoside and teupolioside, produced by plant cell line of *Syringa vulgaris* and *Ajuga reptans* respectively, in post-weaning piglets on growth performances and oxidative status measured as metabolite oxygen reactive (ROMs).

**MATERIAL AND METHODS** - Two hundred forty piglets, half female and half barrows, of average weight of  $8.1 \pm 1.40$  kg were divided into 6 experimental groups ensuring the groups were balanced for live weight, sex and litter. Animals were fed *ad libitum* with isoenergetic and isoproteic diets in order to satisfy requirements during the growing phase. The diet was supplemented with the following levels of antioxidants: 0 (C = positive control, added with 100 mg lincomicine/kg), 5 (LT = low teupolioside or LV = low verbascoside), 10 (HT = high teupolioside; HV = high verbascoside; LT+LV) mg/kg of diet for 56 days. Verbascoside and teupolioside were obtained from plant cell line of *Syringa Vulgaris* and *Ajuga reptans* respectively (IRB s.r.l) using a controlled and highly efficient biotechnology process (Minghetti, 2003). Body weight and feed intake were recorded on 0, 14 and 56 d of the trial. Ten piglets from each group were selected and blood collected by anterior vena cava puncture at 0, 14 and 56 d for reactive oxygen metabolite (ROMs) determination. The method depends on the production of a stable coloured organic radical cation in acidic pH (4.8) with absorption maximum at 505 nm. This chromophore is produced by quantitative reaction of serum ROM and  $Fe^{3+}$ ,  $Fe^{2+}$ , and so forth, with the chromogenic compound. The ROOH hydroperoxide, in presence of Fe, can generate ROz (alkoxyl radical) or ROOz (peroxyl radical) that are titrate from

N,N-dimethyl-p-phenylendiamine added as chromogen to the solution. The results are expressed in Carr units or in mmol/l H<sub>2</sub>O<sub>2</sub> (1 Carr unit corresponds to 0.024 mmol/l of H<sub>2</sub>O<sub>2</sub>).

Statistical analysis on growth performance was performed by analysis of variance and covariance using initial weight as covariate. Comparison between means was done by the Student Newman Keuls t-test. DROMs results were analysed by repeated measure. SPSS was the statistical package used.

**RESULTS AND CONCLUSIONS** – Growth performances are reported in Table 1. HV showed final weight and average daily gain (ADG) higher than control and LT groups. Our results agree well with Asghar *et al.* (1991) who reported a daily gain improvement in post weaning piglet fed with natural antioxidant and vitamin E.

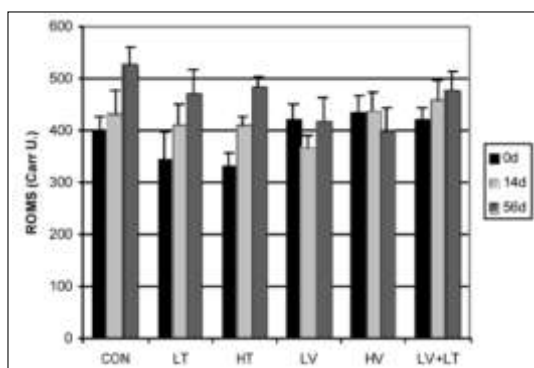
Table 1. Piglet growing performance.

Dietary treatment	Initial weight, kg		Final weight, kg		ADG g/d
	average	CV %	average	CV %	
CONTROL +	7.98	15.41	29.60 a	12.87	386 a
Low Teupoliosie, LT	8.34	16.91	29.25 a	17.09	373 a
High Teupoliosie, HT	8.01	18.08	30.84 ab	17.31	408 ab
Low Verbascoside, LV	7.81	20.23	29.84 ab	18.36	393 ab
High Verbascoside, HV	8.21	18.61	32.07 b	14.37	426 b
LT + LV	8.06	15.14	30.65 ab	17.06	403 ab
SEM	0.130	-	0.651	-	12.33
P	0.751	-	0.027	-	0.032

Kyriakis *et al.* (1998) found a positive effect due to phenolic compounds such as *timolo* and *carvacrolo* on piglet performance reducing diarrhea and mortality in the first three weeks after weaning.

Concerning ROMs results (Figure 1), the average value is in the range of 30 e 40 mg H<sub>2</sub>O<sub>2</sub>/dL and agrees with results reported by Brambilla *et al.* (2001; 2002). ROMs increase as piglet grows (time effect) in C, LT, HT and in LT+LV groups showing at 56 d for C group a value significantly higher than LT, HT and LT+LV confirming the protective action of *Ajuga reptans* vs the oxidative stress. ROMs values in LV group showed at 14 d, a lower value than HV and at 56 d either LV either HV showed ROMs values significantly lower than all the others experimental groups. In fact the strong antioxidant action of verbascoside was reported also by Liu *et al.*, 2003, which found lower Thiobarbituric Acid-Reactive Substances (TBARS) value in plasma rabbit fed with 0.8 mg/kg. Previous studies reported a decreased peroxidation lipidic in muscle of rats (Li *et al.*, 1999) and a high “scavenging” activity against superoxide anion and superoxide radical idroxyl (Gao *et al.*, 1999).

Figure 1 Reactive oxygen metabolite (ROMs in Carr unit) level in serum of piglets.



Time 14 d: V1 < C, T1, T2, V2, V+T (P<0.001).

Time 56 d: V1, V2 < T1, T2, V+T < C (P<0.001).

The natural antioxidant extracted from *Syringa vulgaris* added in highest quantity allowed considering all the experimental period the best growing performance showing an ADG and a final weight higher than the other experimental groups; such as dROMs showed an improved oxidative stability in both integrations of verbascoside. Feeding natural integration with phenylpropanoid glycoside could be considered in order to improve growing performances in post-weaning piglets especially in view of prohibition of use of antibiotics.

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