

THE EFFICIENCY OF RESIN ACID COMPOSITION IN TURKEYS NUTRITION

K. Lipiński¹, J. Vuorenmaa², Z. Antoszkiewicz¹, J. Kaliniewicz¹, M. Mazur¹, Z. Makowski¹



¹Department of Animal Nutrition and Feed Science,
University of Warmia and Mazury in Olsztyn
Oczapowskiego 5, 10-718 Olsztyn, Poland

²Hankkija Ltd, Peltokuumolantie 4, FI-05800 Hyvinkää, Finland

INTRODUCTION

Resin is a substance that coniferous trees secrete at the sites of mechanical injury to prevent the invasion of pathogenic bacteria and fungi and to deter herbivorous animals. Resin contains compounds such as abietic, dehydroabietic, neoabietic, isopimaric, levopimaric and palustric acids, which are a diverse group of hydrophobic diterpene carboxylic acids with antimicrobial, antifungal and antiparasitic activity. Gram-positive bacteria are especially sensitive to resin acids. Traditional medicine in Scandinavia has used the antimicrobial properties of Norway spruce (*Picea abies*) and Scots pine (*Pinus sylvestris*) resin for centuries, and novel applications, like resin-salves for the treatment of severe wounds, have been developed in recent years.

Table 1. Effect of resin acid supplementation on growth performance, FPD score and litter quality

Specification	Groups			SEM	P
	T1	T2 (Progres)	T3 (Progres)		
Growth performance					
Duration, days	105	105	105	-	-
Final bodyweight, g	9.40 ^x	9.55 ^{xy}	9.60 ^y	0.038	0.069
FCR, kg/kg	2.28 ^A	2.23 ^B	2.20 ^B	0.009	<0.001
Mortality, %	3.0	3.0	2.5	0.665	0.943
EEI*, pts	381 ^b	397 ^a	404 ^a	3.481	0.014
FPD score **					
-3 wk	9.50	9.50	6.50	2.363	0.846
-9 wk	67.50 ^A	46.50 ^B	41.50 ^B	3.007	<0.001
-15 wk	114.50 ^A	88.00 ^B	82.00 ^B	3.527	<0.001
Litter quality***					
-3 wk	95.38 ^A	100 ^B	100 ^B	0.518	<0.001
-9 wk	61.72 ^A	78.88 ^B	77.56 ^B	1.542	<0.001
-15 wk	29.20 ^A	40.60 ^B	41.92 ^B	1.127	<0.001

Different superscripts in same row are significant or trending (A/B: $P \leq 0.01$; a/b: $P \leq 0.05$; x/y 0.05 $< P \leq 0.10$).

* European Efficiency Index, ** FPD score, 0-2 scale, FPD classes: 0=no lesions; 1=mild lesions; 2=severe lesion, FPD score = (number lesion class 1 x 0.5 + number lesion class 2 x 2) x 100/10.

*** litter score, 0-4 scale, litter classes: 0= completely dry and flaky; 1= dry but not easy to move foot; 2=leaves imprint of foot and will form a ball if compacted, but ball does not stay together well, 3= sticks to boots and sticks readily in a ball if compacted, 4= sticks to boots once the cap or compacted crust is broken. Litter quality = (number places 0 x 100 + number places 1 x 67 + number places 2 x 34 + number places 3 x 14 + number places 4 x 0)/5.

OBJECTIVE

The aim of the study was to determine the effect of application of Progres (Resin acids) preparation in diets for turkeys on the growth performance of birds, incidence of footpad dermatitis (FPD), litter quality, carcass quality, structure and function of the gastrointestinal tract – GIT (pH, viscosity, short-chain fatty acids - SCFAs).

MATERIAL AND METHODS

A 105-day experiment was conducted on 600 BIG 6 female turkeys to determine the effect of Progres (natural resin acids of Scots pine and Norway spruce, RAs) on the growth performance of birds, incidence of footpad dermatitis (FPD), litter quality, carcass quality, structure and function of the gastrointestinal tract – GIT (pH, viscosity, short-chain fatty acids - SCFAs) (3 treatments, 10 replications, 20 birds per replication). The birds received a basal diet without RAs (T1), or diets supplemented with RAs at 0.5 kg/t (starter 1 and 2, finisher), and at 1.0 kg/t (grower 1 and 2) (T2), or diets supplemented with RAs at 0.75 kg/t (starter 1 and 2, finisher), and at 1.5 kg/t (grower 1 and 2) (T3).

RESULTS

At 105 days of age (end of fattening), the highest body weight was found in birds of group T3 (Progres – higher level). In comparison with birds from the T1 group, the difference was approx. 0.20 kg (9.60 vs 9.40 kg). The mean body weight showed a nearly significant trend in favor of Progres turkeys ($P=0.069$). The resin acids applied in the diets for turkeys improved the feed conversion ratio (FCR). The differences observed were statistically significant between T1 and T3 group (higher level of Progres). Analyses of the results from the entire fattening period indicate that the application of the Progres preparation in the diets improved FCR (2.23, 2.20 vs 2.28, $P \leq 0.01$). The analysis of the European Efficiency Index demonstrated that the use of the study feed additive had a positive impact on the value of this index ($P > 0.05$). Throughout the entire period there was no difference in the mortality rates between groups.

FPD scores were significantly different between Resin acid groups (T2 and T3) and the control group at weeks 9 and 15 ($P \leq 0.01$). In the control group, the footpad dermatitis score was higher than in the groups fed with Progres. There was also a strong positive effect of RAs addition on litter quality ($P < 0.01$).

The use of the study of Progres preparation in diets had a positive impact on the breast muscle yield, although the differences were not statistically significant. Analysis of chemical composition of breast muscle meat did not demonstrate a significant impact of the applied diet on the study indicators.

In the experiment, an assessment of the structure of individual sections of the gastrointestinal tract was performed. The applied nutrition did not have any effect on the weight of the crop, the proventriculus, the gizzard or the small intestine, but the weight of the ceca was varied. A higher weight of the ceca was in the T1 group, the observed differences in comparison with the T2 group were statistically significant (3.60 vs. 3.14 g/kg BW, $P < 0.05$). The weight and pH of the chyme in the crop, the proventriculus and the gizzard did not vary between the individual experimental groups. Turkeys fed diets with Resin acids were characterized by a lower weight of the digesta in the small intestine ($P < 0.01$) and in the ceca ($P = 0.064$). The applied diets increased the pH of the digesta in the small intestine ($P < 0.01$).

The viscosity of the chyme of the small intestine and the ceca were not varied among the experimental groups.

CONCLUSIONS

- The use of a resin acid preparation in diets for turkeys affected an increase in the total body weight by 1.6% (Progres RA 0.5-1.0 kg/t) and by 2.1% (Progres RA 0.75-1.5 kg/t).
- The analysis of the FCR demonstrated that supplementation with the studied feed additive significantly improved this indicator ($P < 0.01$).
- The analysis of the European Efficiency Index demonstrated that the use of a resin acid preparation resulted in an improvement of this index ($P < 0.05$).
- The use of Progres RA preparation in diets did not affect the survival of turkeys.
- The addition of resin acids in the diets decreased footpad lesions at 9 and 15 weeks ($P < 0.01$) and increased litter quality ($P < 0.01$).
- The inclusion of the Resin acids in turkey diets had no effect on carcass quality, meat quality or most parameters of GIT structure and function.