The effects of nonlphenol on growth, egg production and hatching results in the quail

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Abstracts: Alkylphenolpolyethoxylates (APEs) are used as non-ionic surfactants and anti-oxidants in detergents, herbicides, pesticides, paints and plasticware. In this study, it was sought to determine the effects of nonylphenol (NP), a derivative of (APEs), on growth, feed conversion ratio, egg production, and hatching in quails. Quails were exposed to 0 (control), 10, 100, 500, 1000 and 5000 µg NP/kg feed. Data were analyzed by one-way ANOVA followed by TUKEY's test. Results showed that nonylphenol did not have significant effect (P>0.05) on growth and feed conversion ratio in quails among all groups in the first six weeks of treatment. Although nonylphenol did not have significant effect on egg production and feed consumption in layers after six weeks of treatment, there was a significant reduction in egg production after ten weeks of treatment in quails exposed to the highest concentration of NP (P<0.05). It was also determined that nonylphenol did not have significant effect on hatching results (P>0.05). In conclusion, it can be said that NP could have adverse effects on egg production when quail exposed to higher concentrations of NP in a longer period of time.

Keywords: nonylphenol; quail; growth; egg

Introduction

Aklylphenol ethoxylates (APEs) are used as non-ionic surfactants and as anti-oxidants in detergents, herbicides, pesticides, paints and plasticware (Ahel et al. 1994; Shao et al. 2006; Tyler et al. 1998). They have demolishing effects on the endocrine system (Nimrod and Benson, 1996). APEs are produced about 500,000 metric tons in a year in the world and it has been shown that 60 % of producing quantities accumulates in rivers, lakes and seas (Renner, 1997). NP may end up in the ration of poultry through grounded fish flour or through herbicides and pesticides used in agriculture. NP, consumed is might be harmful for health and hatching in quail, moreover NP may have hazardous effect on human also. Quails are more suitable for evaluating the effects of NP disrupters in vivo, since the incubation time for hatching is short and the sexual maturation occurs in a relatively shorter time period of time than that of chickens or mammalians. Also, their size is convenient for handling and breeding. Razia et al. (2005)

investigated the effects of 17B-östradiol and P-nonylphenol in the immune and endocrine organs of japanese quail embryo. They found that NP has estrogenic effects, but these effects are mild in comparison to those of estrogen itself. Yoshimura et al. (2002) observed only a minor disorder in the female reproductive tract in the F1 generation in the japanese quail treated with NP for 5 days by intramuscular injection. Such information suggests that NP is a weak endocrine disrupter.

Therefore, the objective of this study was to determine the adverse effects of nonylphenol on growth, egg production and hatching results in quail.

Materials and methods

There were three different trials in this experiment. Growth, egg production and hatching were performed. Firstly, NP stock solution was prepared and as outlined below and feeds containing different concentrations of NP were prepared. Nonylphenol (1 g/lt) Stock solution was prepared in etyl-alcohol. NP's was also prepared with etyl- alcohol in the 5 different concentrations; 10, 100, 500, 1000 ve 5000 µg NP/10 ml etyl- alcohol respectively. These solutions were sprayed on the growth and laying hen feeds.

Growth trial

A total of 1080, 7 days old quails were utilized in the experiment. There were 6 groups in the experiment. Quails were fed with commericial feed which contain 24 % crude protein and 2900 kcal/kg metabolisable energy. Quails were weighed weekly and feed consumption was also in order to calculate of feed convertion ratio. The experiment was lasted 6 weeks.

Egg production and hatching trial

When quails were 42 days old, 8 females and 2 males were selected and kept in the laying cages. Totally 200 laying quails were utilized in the experiment. The experiment continued from 6 to 14 weeks of age. Feed consumption was determined at two weeks during the experiment. Egg production was recorded daily. Feed and water was supplied ad-libitum. Artificial light was provided 16 hours. Quails were fed with commericial layer quail feeds. Quails were fed with commericial feed which contain 20 % crude protein and 2900 kcal/kg metabolisable energy.

Hatching trial

Hatching trial was conducted to determine the effects of NP on a hatching in this study. A total of 1620 eggs were used in this study. A hatcher containing an incubator was used

Statistical analysis was performed by one-way ANOVA followed by Tukey test (Spss. inc. 2001).

Results and discussion

In this study, we demonstrated that NP, a chemical substance, has an effect on growth, egg production and hatching results in the quails. There were no statistical differences according to body weight gain (BWG), feed consumption(FC) and feed convertion ratio (FCR) amoung the groups during the first trial of experiment (table 1) ($P>0.05$). Our results confirmed the results shown by Chitra et al.(1994) that NP administered at 1, 10 and 100 µg/kg body weight per day for 45 days orally did not have dramatic effect on body weight. Mean egg production (EP), FC, FCR, are shown in Table 2. There was statistical differences in terms of egg production values among the groups ($P<0.01$). There was decrease in egg production in group 5 during the egg production trial. As mentioned above, the body weight of the animals treated with NP did not show any significant change. However, Latendresse et al. (2001) reported that when NP used in the pregnant rats diet up to 2000 ppm, pup weights from birth through weaning were not significantly different from controls, but the average weight of both sexes was significantly

lower in comparison to control group, beginning with the posthatch day 28 weighing. In addition to those researchers noticed that terminal body weights of males and females in the 2000 ppm dose group were 74% and 85% of controls respectively. Otherwise, there was severe polycystic kidney disease present in 100% of the 2000 ppm exposed both sexes, said those researchers.These results are affirmed by Hirofumi et al.(2000). In the present study, we observe that the results of the body weight values of the quails were not differ. Since we used different animals, methods, feed and ambient, this situation may clear of our results.Shakimura et al. (2002) also confirmed with our results about body weight values. Although, some researcher (NTP,1997) reported that there was a reduction of body weight, feed consumption values were'nt demonstrated any difference in rats.

Table 1 Mean Body weight gain of the groups (1-6 Weeks of Age)

	Control		Group 1 10 µg/kg		Group 2 100 µg/kg		Group 3 500 µg/kg		Group 4 1000 µg/kg		Group 5 5000 µg/kg		P
	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	
BWG,g	171.39	1.01	167.69	3.04	174.26	3.99	168.76	3.48	173.66	3.93	171.32	1.70	NS
FC,g	766.45	21.03	769.32	37.49	773.93	16.09	731.97	27.08	808.03	26.79	767.09	23.26	NS
FCR,g feed/g BW	4.47	0.13	4.58	0.18	4.45	0.14	4.34	0.18	4.65	0.11	4.48	0.18	NS

BWG: Body weight gain, FC: Feed consumption, FCR: Feed convertion ratio

There was a reduction in egg production in group 5 (5000 µg/kg NP group) in contrast to control group. These results may be due to orally administered NP is absorbed in the alimentary canal, circulated in the blood and accumulated in the egg yolk. Thus, Fujita et al. (2004) are confirmed to our results. Moreover, there were no statistical differences between the groups in point of hatching results. These findings are confirmed by Nagao et al.(2001), who decleared, there were no treatment-related changes in any reproductive parameter, including estrous cycle, mating, fertility, delivery and lactation, except for significant decreases in the numbers of implantation sites and live pups and a significant decrease in ovary weight in the 50 mg/kg.

Table 2 Mean egg production (EP) and hatching parameters

	Control		Group 1 10 µg/kg		Group 2 100 µg/kg		Group 3 500 µg/kg		Group 4 1000 µg/kg		Group 5 5000 µg/kg		P
	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	
EP,%	78.22^{ab}	1.57	80.86^{a}	1.57	77.17^{ab}	1.65	77.35^{ab}	1.55	81.09^{a}	1.33	73.46^{b}	1.53	**
FC,g/day	35.89	0.65	35.90	1.29	34.49	0.89	36.30	0.70	36.69	0.77	35.52	0.81	NS
FCR,kg feed/one dozen egg	0.57^{b}	0.003	0.55^{b}	0.002	0.57^{b}	0.004	0.58^{ab}	0.004	0.55^{b}	0.002	0.60^{a}	0.003	*
Hatching rate(%)	73.77	4.86	79.96	3.33	73.10	4.94	75.31	4.07	81.32	3.11	83.40	3.41	NS

NS: Non significant, *: P<0.05, **: P<0.01, Mean values with different superscripts within a row differ significantly.

It is concluded that NP at a dietary concentration of 5000 mcg/kg could be harmful to quails. Thus, it is better not use in the quail and other animals diets.

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