Effects of Dietary Yohimbe (*Pausinystalia Yohimbe*) and Puncture Vine (*Tribulus Terrestris*) Extracts for Growth Performance, Body Composition and Digestive Parts of Broiler Chicks[1]

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Abstract
This study was carried out to investigate the effects of Pausinystalia yohimbe (PY) and Tribulus terrestris (TT) extracts (a commercial) on growth and body chemical composition of broiler chicks. One-day old mixed sex 255 Ross 308 broiler chicks were used. They were allocated into five groups (control, 60 ppm PY, 120 ppm PY, 60 ppm TT and 120 ppm TT supplementation for 21 days) with equal body weight. Supplementation to diet were withdrawn at 21-d and all experimental birds were fed on finisher diet until the end of the study 41-d. 60 birds were slaughtered at 41-d to determine their body composition. In conclusion, both Pausinystalia yohimbe and Tribulus terrestris extracts did not change growth performance body composition and digestive parts of broiler chicks (P>0.05).

Keywords: Chicks, pausinystalia yohimbe, tribulus terrestris, performance, body composition.

[1] This study is summarized from the MSc Thesis of the first author and the preliminary results were presented as a poster in V. Ulusal Zootekni Bilim Kongresi, Van-Turkey.

1. Introduction

The uses of antibiotics and synthetic hormones in livestock production have been banned any more due to danger to animal and human health. Alternative to antibiotics and growth promoters, more studies have become necessary to use harmless agents such as enzyme, probiotic, prebiotic, organic acids, essential oils, plant extracts and their mixtures (Ceylan et al., 2003; Castanon, 2007; Bilgin and Kocabağlı, 2010). Aromatic and medicinal plants which are as dependent on antimicrobial and antioxidants their effects have got some properties such as growth promoter and improving feed conversion and beneficial to human health. Nowadays, benefits of aromatic and medicinal plants and plant extracts in poultry nutrition are clear (Kutlu, 2007). Plant extracts may enhance feed efficiency, increase carcass quality, reduce slaughter age of broiler chick and decreased their breeding cost (Javed et al., 2009).

Pausinystalia yohimbe (PY) and *Tribulus terrestris* (TT) extracts act as sexual enhancers and improve muscle mass in human and sold commercially. Some researches reported that these materials increase testosterone hormone level in body and body weight gain (Yeşil, 2010; Anonymous, 2016a, b). However, steroidal saponin in TT increases yield in livestock animals and prevents cancer in human (Sun et al., 2002; MacDonald, 2005; Şanlı, 2010; Yücelt, 2011).

Supplementation *Tribulus terrestris* extract to drinking water in Brown Lohman hens, Guinea fowl and White Plymouth Rock-mini cocks was studied by some scientists. TT extract decreased serum glucose level in Brown Lohman hens (Grigrova et al., 2008a), decreased serum cholesterol level in guinea fowl (Grigrova et al., 2009), increased reproductive performance in White Plymouth Rock-mini cocks (Grigrova et al., 2008b) and stimulates the production of male reproductive cells (Nikolova et al., 2015) and decreased total cholesterol of egg yolk in Japanese Quail (Grigrova et al., 2014). But Duru (2016) adding TT Saponin Extract to diet no effect on serum cholesterol, glucose, triglyceride and egg yolk cholesterol in laying hens. Penkov and Nikolova (2016) were added *Tribulus terrestris* dry extract to drinking water in Japanese quail and at the end of trial observed any effect on forage consumption. The addition of *Tribulus terrestris* extract to drink water advanced significantly the laying productivity (Nickolova, 2010).

Çek et al. (2007) found that TT improved the growth in fish (Convict Cichlid *Cichlasoma nigrofasciatum*). Şahin (2009) reported that using TT powder can be alternative for antibiotics. It has not been seen that any study in literature survey about using PY in feeding broiler chick yet.

In this study, it was aimed to investigate the effects of *Pausinystalia yohimbe* and *Tribulus terrestris* extracts on growth performance body composition and digestive parts of broiler chicks.

2. Material and Methods

Commercial broiler chicks (Ross) were obtained, 1-day old. At the beginning of study, 255 male and female broiler chicks aged 1-d old were individually weighed, were kept in floor pens (1.4 m x 1.4 m) in a poultry room and allocated into five experimental groups of equal mean body weight (43.8±2.7 g per bird) (1 control group and 4 treatment groups). Each group included 51 one-day old birds which were sub-divided into by three for 3 replications each one consisted of 17 birds, and chicks subjected to 60 ppm PY, 120 ppm PY, 60 ppm TT, 120 ppm TT supplementation for 21 days. Supplementation to diet were withdrawn at 21-d and all experimental birds were offered to have finisher diet until the end of the study 41-d (Table 1). The temperature of the room with continuous lighting was maintained at 33°C initially, and then reduced by 3°C/ wk until it reached 21°C, at which temperature the room was maintained for the rest of the feeding period.

Extracts were added and mixed by preparing one kg feed for each supplementation commercial broiler grower (Table 2). Body weight was recorded weekly, and feed intake was recorded daily. Feed and water were available *ad libitum* 60 birds were slaughtered at 41-d to determine their carcass characteristics, body composition and digestive parts. Carcass parts were deboned and, then, meat and bone were weighted. Meat

mass without skin was minced three times by using meat grinder to take 50 g sample for each animal. These samples were analysed chemically to determine dry matter, protein, lipid and crude ash (AOAC, 2002).
The data concerning growth, body composition and digestive parts were analysed using the One Way ANOVA procedure of Statistical Package for the Social Sciences (SPSS, 1999) (Windows version of SPSS release 10.01) with Duncan's Multiple Range Test used to identify the significant differences between the respective means.

Table 1. Experimental design.

Groups	**Treatment (ppm in grower diet)**	**n**	**Each replication**
1.Group	Control	51	17
2.Group	60 ppm *Pausinystalia yohimbe* extract	51	17
3.Group	120 ppm *Pausinystalia yohimbe* extract	51	17
4.Group	60 ppm *Tribulus terrestris* extract	51	17
5.Group	120 ppm *Tribulus terrestris* extract	51	17

*Extracts were supplemented to grower until 21-d old.

Table 2. Nutritional composition of feed ingredients in present study.

Nutrient, %	**Grower (1^{st} -21^{st} days)**	**Finisher (22^{nd}-41^{st} days)**
Dry matter, %	88	88
ME (Kcal/Kg)	3100	3100
Crude protein, %	23	20
Crude fiber, %	0.6	6
Crude ash, %	8	8
Lysine, %	1.2	1
Methionine, %	0.5	-
Methionine-Sistine, %	-	0.72
Ca, %	1.2	0.9
P, % (available)	0.7	0.6
Na, %	0.2	0.2
NaCl, %	0.35	0.35

*Per kg diet included 8000 IU Vitamin A, 800 IU Vitamin D_3, 15 mg Vitamin E, 2 mg Vitamin K_3, 4 mg Vitamin B_2, 10 mg Vitamin B_{12}.

3. Results and Discussion

The effect of supplemental PY and TT extracts on growth performance, body composition and digestive parts of broiler chicks are given in Table 3.

Table 3. After supplementation (plant extracts) to diet were withdrawn at 21-d on growth performance and carcass parameters of broiler chicks (41-d old).

Parameters (per bird)	**Control**	**TT (60 ppm)**	**TT (120 ppm)**	**PY (60 ppm)**	**PY (120 ppm)**	**SEM**	**P**
Growth Performance							
41-d old body weight	2462.6	2402.0	2481.5	2544.7	2491.2	22.60	0.38
Gain (g/day)	59.0	57.5	59.5	61.0	59.7	0.55	0.38
Feed consumption (g/day)	89.9	89.1	91.6	92.6	92.6	1.91	0.97
FCR (g feed: g gain)	1.52	1.55	1.54	1.52	1.56	0.007	0.36
Body Components							
Whole Carcass weight	1793.3	1781.0	1738.5	1889.0	1847.7	30.58	0.58
Breast weight	618.3	595.2	552.3	600.5	609.8	8.66	0.13
Legs weight	515.5	523.7	521.3	534.2	533.0	8.95	0.96
Feather weight	117.2	111.5	110.0	115.2	114.3	1.86	0.77
Skin weight	208.0	192.0	200.7	200.8	217.5	3.99	0.34
Abdominal fat weight	39.3	43.8	45.5	47.0	44.8	1.79	0.73
Heart weight	8.4	9.0	9.0	9.5	10.7	0.31	0.17
Liver weight	30.0	33.2	33.0	34.3	33.7	0.71	0.36
Body Chemical Composition							
Water (%)	71.4^{ab}	71.3^{ab}	72.4^{a}	70.7^{b}	71.0^{b}	0.18	0.03
Protein (%)	20.5^{b}	19.8^{b}	20.8^{ab}	19.9^{b}	21.7^{a}	0.15	0.0001
Lipid (%)	6.3^{b}	6.8^{ab}	7.2^{a}	7.3^{a}	6.3^{b}	0.13	0.02
Crude ash (%)	1.0	0.9	1.2	1.1	1.0	0.04	0.27
Bone rate (%)	18.4	19.5	19.0	19.2	19.3	0.35	0.87
Meat yield (%)	65.3	64.6	63.6	63.2	63.6	0.48	0.67
Digestive parts							
Crop weight	8.0	7.8	7.1	8.7	9.8	0.41	0.25
Proventriculus weight	10.0	10.0	9.5	9.3	9.6	0.29	0.92
Gizzard weight	30.33	34.67	33.0	35.33	34.33	0.88	0.41
Gizzard width	5.7	5.7	5.8	6.0	5.9	0.08	0.78
Gizzard length	3.9	4.1	4.3	4.2	4.4	0.08	0.33
Pancreas weight	2.9	3.1	2.7	2.9	2.8	0.14	0.90
Duodenum weight	8.2	8.2	7.8	8.2	8.8	0.32	0.95
Duodenum length	34.4	35.4	34.4	39.1	38.5	0.86	0.20
Ileum+Jejunum weight	42.4	41.6	42.3	46.7	45.5	1.04	0.46
Ileum+Jejunum length	165.3	158.6	153.5	164.8	154.7	2.70	0.53
Cecum weight	6.4	6.9	6.7	7.6	6.2	0.27	0.51
Cecum length	20.7	22.6	22.3	20.9	21.9	0.36	0.36

PY:** Pausinystalia yohimbe, **TT:** Tribulus Teresstris. **Weight: g, Length: cm. ***: **SEM:** Standard error of difference between means. * **a-b:** showing difference between within each row with significance of $P<0.05$.

120 ppm PY extract increased the protein accretion of carcass meat in 41-d old significantly ($P<0.01$). High dosage of PY which may have been confined the protein accretion in body when protein metabolism maximum (Fig. 1).

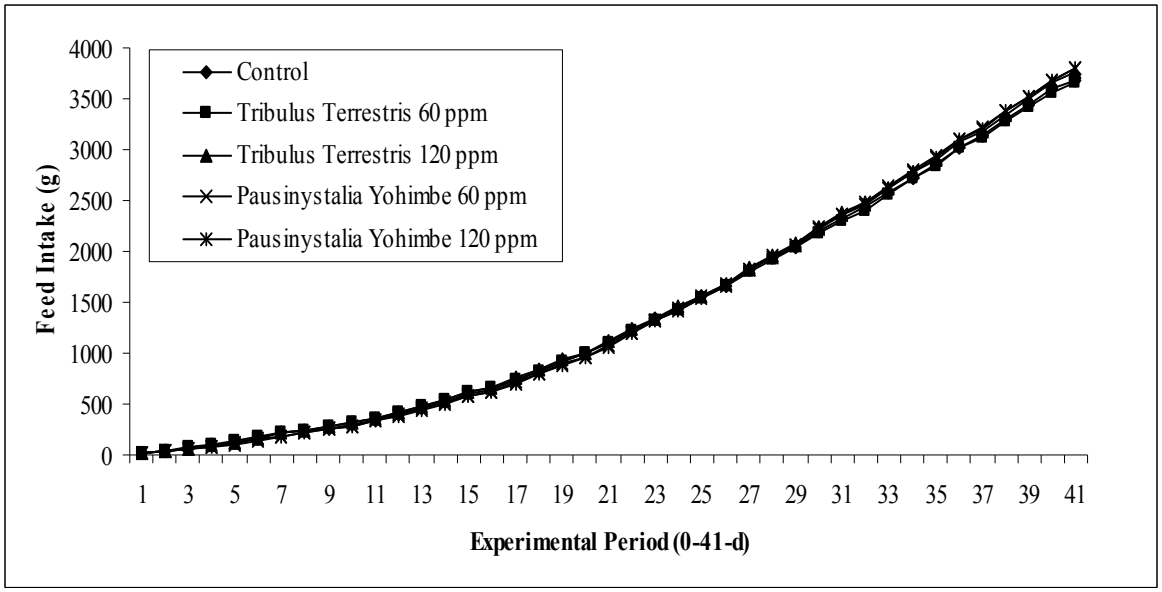

Figure 1. Feed intake in broiler chicks during experimental period.

These results showed that the current dosages of plant extracts did not affect significantly growth performance, body composition and digestive parts of the present broiler chiks. Therefore, the plant extracts should be investigated in more detailed with respect to protein metabolism (Fig 2).

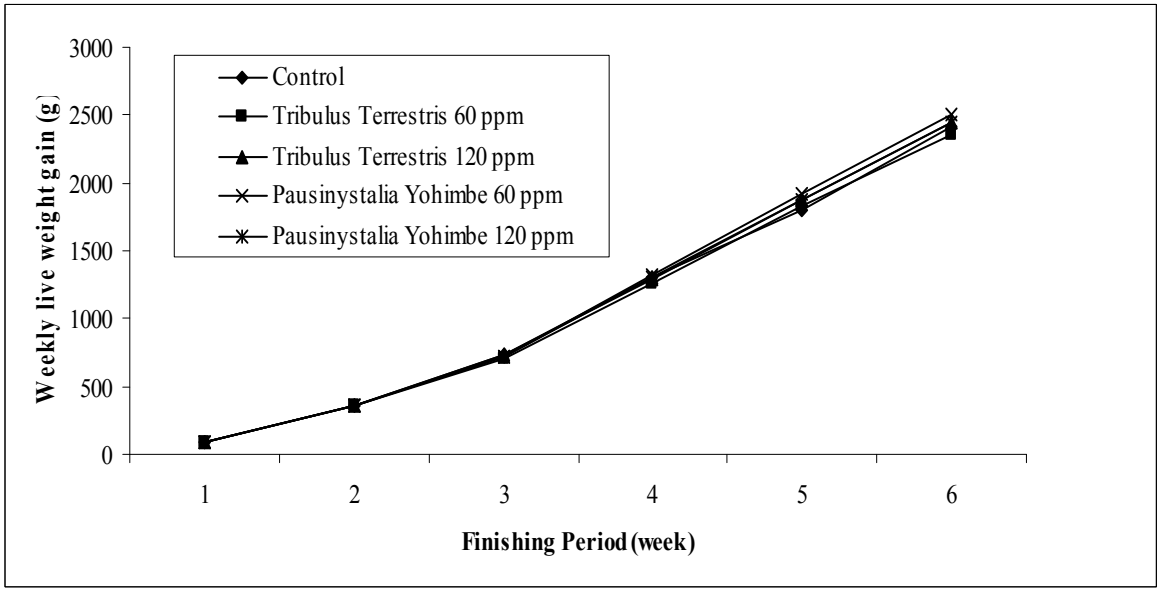

Figure 2. Weekly live weight gain in broiler chicks during experimental period.

In broiler chicks, there has not been any information PY extract on body weight gain on literature but TT extract has been studied. There has been a lack of efficacy of plant extracts on broiler performance and body composition. This might be attributed to the current used lower doses. This was evidenced by PY high doses

120 ppm. 120 ppm PY tented to increase protein accretion in chick's body. In this study, plant extracts was used just between 1-21 days. If the plant extracts could use until slaughtering time, 41-d old the effects of plant extracts would be cleaner.

Gauthaman et al. (2002) observed that the TT extract increased testosterone levels in rats. Çek et al. (2007) observed that the growth rate of fish (Convict Cichlid) feed with TT extract was found to be faster than that of the controls. Şahin (2009) control group consisted of 0.06% alfamune and 0.025% flavomycine and the other groups consisted of 4, 8 and 12 g TT plant powder per kg. Duru and Şahin (2012) observed that 1 and 2 g TT powder was no effect on growth performance of broiler chicks. In the present study TT extract was used between 0-21 days. At all levels TT groups birds ate and gained less during 0-21 d.

4. Conclusion

These results showed that both *Pausinystalia yohimbe* and *Tribulus terrestris* extracts, at least, did not decrease growth in broiler chicks but needed to be investigated their higher doses in order to test their effect on protein metabolism in chicks with considering their cost. It is needed more studies for developing production of alternative feed supplements in the World due to more secure and healthy food production for humans.

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References

Anonymous (2016a). Yohimbe – Herb of controversy and potential. [Online] Available: http://www.chinese-herbs.org/yohimbe/ (June 29, 2016)

Anonymous (2016b). Yohimbe bark and extract: Body building supplement reviews and information. [Online] Available: http://www.bodybuilding4u.com/bodybuilding-supplements/yohimbe-bark-extract.htm (June 29, 2016)

AOAC (2002). Official Methods of Analysis. 17th ed., Vol. 1. AOAC, Arlington, VA.

Bilgin, A.Ş., & Kocabağlı, N. (2010). Etlik piliç beslemede esansiyel yağların kullanımı. İstanbul Universitesi Veteriner Fakültesi Dergisi, 36(1), 75-82.

Bligh, G.R., & Dyer, J.N. (1959). A rapid method of total lipid extraction and purification. Canadian Journal of Biochemistry and Physiology, 37(8), 912-917.

Castanon, J.I.R. (2007). History of the use of antibiotic as growth promoters in european poultry feeds. Poultry Science, 86, 2466–2471.

Ceylan, N., Çiftçi, I., & İlhan, Z. (2003). Büyütme faktörü antibiyotiklere alternatif yem katkılarının etlik piliçlerde besi performansı ve bağırsak mikroflorası üzerine etkileri. Turkish Journal of Veterinary and Animal Sciences, 27, 727-733.

Çek, S., Turan, F., & Atik, E. (2007). Masculinization of convict cichlid (*Cichlasoma nigrofasciatum*) by immersion in tribulus terrestris extract. Aquaculture International, 15 (2), 109-119.

Duru, M., & Şahin, A. (2012). Effects of dietary puncture vine *(Tribulus terrestris)* powder in different carriers on growth performance, carcass characteristics and blood parameters of broiler chicks. Kafkas Üniversitesi Veteriner Fakültesi Dergisi, 18 (3), 359-365.

Duru, M. (2016). Demir dikeni (*Tribulus terrestris*) saponin ekstraktının yumurtacı tavuklarda verim, yumurta kalitesi ve bazı kan parametreleri üzerine etkileri. Türkiye VI. Organik Tarım Sempozyumu, 31 Ağustos - 3 Eylül 2016, Kayseri, Kabul edildi.

Gauthaman, K., Adaikan, P.G., & Prasad, R.N.V. (2002). Aphrodisiac properties of Tribulus terrestris extract (Protodioscin) in normal and castrated rats. Life Science, 71(12), 1385-1396.

Grigorova, S., Vasileva, D., Kashamov, B., Sredkova, V., & Surdjiiska, S. (2008a). Investigation of Tribulus terrestris extract on the biochemical parameters of eggs and blood serum in laying hens. Archiva Zootechnica, 11 (1), 39-44.

Grigorova, S., Kashamov, B., Sredkova, V., Surdjiiska, S., & Zlatev, H. (2008b). Effect of Tribulus terrestris extract on semen quality and serum total cholesterol content in White Plymouth Rock-mini cocks. Biotechnology in Animal Husbandry, 24 (3-4), 139-146.

Grigorova, S., Abadjieva, D., Nikolova, M., & Penkov, D. (2009). The effect of Tribulus terrestris extract on egg yolk lipids and serum cholesterol content in guinea fowls. Biotechnology in Animal Husbandry, 25 (5-6), 1109-1115.

Grigorova, S., Nikolava, M., Penkov, D., & Gerzilov, V. (2014). Egg yolk lipids change in japanese quail given Tribulus terrestris extract. Bulgarian Journal of Agricultural Science, 20 (6), 1472-1476.

Javed, M., Durrani, F.R., Hafeez, A., Khan, R.U., & Ahmad, I. (2009). Effect of aqueous extract of plant mixture on carcass quality of broiler chicks. ARPN Journal of Agricultural and Biological Science., 4, 37–40.

Kutlu, H.R. (2007). Büyüme uyarıcı antibiyotiklere karşı seçenek aranıyor. Cumhuriyet/Tarım, 13.02.2007, s.19.

Macdonald, R.S., Guo, J.Y., Copeland, J., Browning, J.D., Sleper, J.D., Rottinghaus, G.E., & Berhow, M.A. (2005). Environmental influences on isoflavones and saponins in soybeans and their role in colon cancer. The Journal of Nutrition, 135(5), 1239-1242.

Nikolova, M., & Penkov, D. (2010). Influence of Tribulus terrestris extract supplementation on laying productivity and eggs quality in japanese quails. Journal of Central European Agriculture, 11 (4), 373-380.

Nikolova, M., Penchev, G., Grigorova, S., Penkov., D., Hristev, H., & Koeva, I. (2015). Effect of different concentrations of Tribulus terrestris dry extract on histological structure of gonads and kidneys in japanese quail. Macedonian Journal of Animal Science, 5 (1), 11–17.

Penkov, D., & Nikolova, M. (2016). Study on the effect of dry extract of Tribulus terrestris on the forage consumption rate in japanese quail (*Coturnix coturnix japonica*). Journal of Central European Agriculture, 17(1), 56-62.

SPSS (1999). SPSS Version 10.01. SPSS Inc., Chicago, Illinois, USA.
Sun, W., Gao, J., Tu, G., Guo, Z., & Zhang, Y. (2002). A new steroidal saponin from Tribulus terrestris linn. Natural Product Letters, 16(4), 243-247.

Şahin, A. (2009). Effects of dietary Tribulus terrestris L. powder on growth performance, body components and digestive system of broiler chicks. Journal of Applied Animal Research, 35, 193-195.

Şanlı, U.A. (2010). Kanser gelişimini önlemede, beslenme ve diyet. [Online] Available: http://www.doktorsitesi.com/yazi/5084/kanser-gelisimini-onlemede--beslenme-ve-diyet?islem=&a_id=98 (June 29, 2016).

Yeşil, T. (2010). Tribulus terrestris L. (çoban çökerten) (zygophyllaceae) türü üzerinde farmasotik botanik yönünden araştırmalar. Ankara Üniversitesi Sağlık Bilimleri Enstitüsü. Yüksek Lisans Tezi, 116 s, Ankara.
Yücelt, Ö. (2011). Saponinler, saponin kaynakları ve çevre. [Online] Available: http://www.ekolgida.com/makale/16/saponinler-saponin-kaynaklari-ve-cevre (April, 25, 2011).