Research Journal of Applied Sciences, Engineering and Technology 7(1): 161-164, 2014
DOI:10.19026/rjaset.7.234
ISSN: 2040-7459; e-ISSN: 2040-7467

Submitted: May 07, 2013 Accepted: June 04, 2013 Published: January 01, 2014

Research Article

Effect of Marshmallow's Root Extract on Thyroid Hormones in Broilers

Farshid Roshangar, Mehrdad Modaresi and Majid Toghyani
Department of Animal Science, Khorasgan Branch, Islamic Azad University, Isfahan, Iran

Abstract: Marshmallow (*Althaea officinalis L.*) is belonging to Malvaceae family. Previous studies have shown that this plant has many physiological effects on hormone systems. The goal of this study was investigating the effect of root extract of this plant on concentrations of thyroid hormones in broilers. 240 broilers were divided into four groups with five replications and twelve members in each replication. A group was control group and other groups were fed by various doses of extract (0.25, 0.5 and 1%) for 42 days in drinking water. At last two broilers were selected randomly from each replication, blood samples were taken and concentration of T3, T_4 and TSH hormones were measured using Eliza method and Monibind Kit. Obtained data were analyzed using SAS program and means were compared using Duncan multiple ranges test. Concentration of T3 hormone was decreased significantly ($p<0.05$) in third and fourth groups (doses 0.5 and 1%) but 0.25% of extract (group 2) increased it none significantly. Concentration of T_4 hormone was not affected by treatments. There was significant differences between TSH hormone of third and fourth group with control group ($p<0.05$), but second group didn't affect this hormone. On the whole the extract of marshmallows root can affect T_3 and TSH hormones dose dependently and is effective in metabolism in this way.

Keywords: Broilers, marshmallows root extract, T_3, T_4

INTRODUCTION

Thyroid hormones affect actions of the most body tissues. These hormones control development and maturity process (Fisher *et al*., 1982) and action of some organs like heart, stomach, liver (Daza *et al*., 1982; Wiekenden *et al*., 1997) and neural system. Thyroid gland is the biggest and one of the most important glands of body which its hormones (T_3 and T_4) are very importint for growth, development and metabolism. Hypothiroidism is one of the most important diseases of endocrine glands in human and animals. This disease is following generally by symptoms like fatigue, drowsiness, slow muscles, slow brain processes, slow heart beating, reduction in heart output, reduction in blood volume, increase in body's weight and dry skin (Aurthor and Beckett, 1999). The important role of endocrine glands including thyroid in metabolic actions of body is obvious. Hyperthyroidism or hypothyroidism and fluctuations of relating hormones can affect chemical activities of body highly (Kar *et al*., 2002). Hypothyroidism is made by Iodine deficiency, thyroid disease or autoimmune disorders (such as Hashimoto's thyroiditis) (Ott *et al*., 2011; Ozturk *et al*., 2009). Successful medication of hypothyroidism is only possible when level of thyroid hormones in peripheral tissues be in natural level which this needs to substitue hormones (Mistry *et al*., 2011). Considering the ancient use of plants in medication, marsmallow plant was used in this study as a pharmaceutical plant which has probable effects on concentration of thyroid hormones.

Marshmallow (*Althaea ofticinalis* L.) is a plant from malvacea family which is probably originated to Asia and Europe (Batooli, 2002). Using this plant for medication has been common for long time. The root of marsmallow has many properties including: skin softener and tranquilizer, treating intensive coughs, angina, bronchitis and diseases induced inflammation (Mirhidar, 2002; Sutovska *et al*., 2007), kidney stone, constipation and cramps (Zargari, 2004). Flavonoides from polyphenoles group (Bradley, 1992; Razavi, 2003), Polysaccharids (Sutovska *et al*., 2007; Kardosova and Machova, 2006) and mucins (Pakravan *et al*., 2007) are from important discovered compounds of marshmallow's root. Root has also chemical compounds like musillage matters, starch, cumarins (scopoletin), sugar compounds, pectin, aspargin, a little oil, flavonoides, glycosides, ethanole, 3-4 dyhydroxy benzylocta decan, 5-β and 13-β dihydroxy nonacosanyl godolite, tillerozide, campferole, chlorogenic acid, caffeic acid and oxalate (Zoobi and Mohd, 2011).

Scopoletin (7-hydroxy 6- metoxy cumarin) of root is used in rats for increasing thyroid activity, lipid peroxidation and increase in blood sugar. This matter seperates lipid peroxidation of liver and increase the

Corresponding Author: Farshid Roshangar, Department of Animal Science, Khorasgan Branch, Islamic Azad University, Isfahan, Iran

activity of anti oxidants, superoxide desmootase and catalase this shows that scopoletin is the reason of anti thyroid activity and increase in blood sugar without causing liver poisonity (Panda and Kar, 2006). Considering that there isn't any scientific study about the effect of roots extract on thyroid hormones, the aim of this study was probable effect of its extract on concentrations of thyroid hormones in broilers.

MATERIALS AND METHODS

The study was done in south west of Yasouj (Iran). 240 broilers from Ross 308 race and one day old were divided in pour groups. Each group was divided into five replications with 12 members. Three groups were treatment groups and one group was control. Broilers were located randomly and kept in cages by one square meter area (1*1 m) for 42 days. Samples had free access to food. According to husbandry manual of Ross 308, temperature was 32°C among first week and then was decreased 1°C every day three to final temperature about 21-23°C. Gas burner provided needed temperature and light was produced by 60 watts lamps which were located at height of 2 m. Light period were adjusted for 23 h brightness and one hour darkness. Yield parameters like food consumption, weight increasing and conversion factor in three periods of 0-14 days, 14-28 days and 28-42 days. Control group was used drinking water only and didn't recieve any extract. Second, third and fourth group were recieved 0.25, 0.5 and 1% of extract in their drinking water.

To prepare the extract, marshmallows roots were collected in late autumn of 2012 before flowering stage from Dena heights of Zagros mountains in southwest of Iran (kohgilouyeh and Boyerahmad province). Roots were dried in shade and milled by circular blade mill. 500 mg of dried powder was prepared and then 500 mL of distilled water with temperature about 70-80°C was added to powder in an erlen. Erlen mouth was covered by foil and was placed in water bath (60°C). After 24 h solution of earln was squeezed and obtained extract was filtrated using filtration papers and Bokhner funnel. The process was replicated six times to prepare required extract (Mashhadian and Rakhshandeh, 2005).

At the end of experiment two broilers were selected randomly from each replication and blood samples were taken from vein under the wing. Samples were centrifuged for 2 min and 3000 cycles per minute to separate the serum. After that samples were kept at-20°C until hormone measuring T_3, T_4 and TSH hormones were measured using Eliza method and Monobind kits made by USA.

For determining T_4 25 µL of sample and for T_3 and TSH, 50 µL of it were used. 100 µL of conjugate solution was added and were incubated for 60 min in room temperature. After that 300 µL of rinsing solution was added and rinsing was done for three times.100 µL of ready made substrate was added to each sample and plate was incubated in room temperature and darkness for 15 min. Then 50 µL of stop solution was added and plate was shaked by hand for 15-20 sec and at last plate was read at wave length of 450 nm.

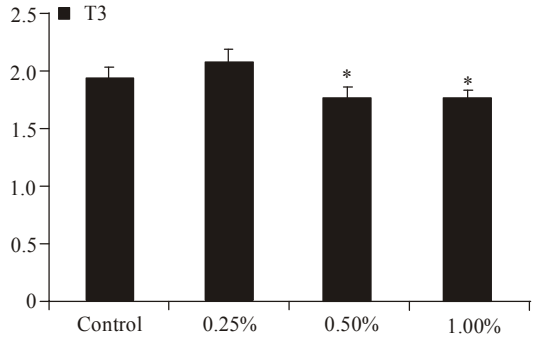

Fig. 1: Mean comparison of T_3 hormone in studied groups

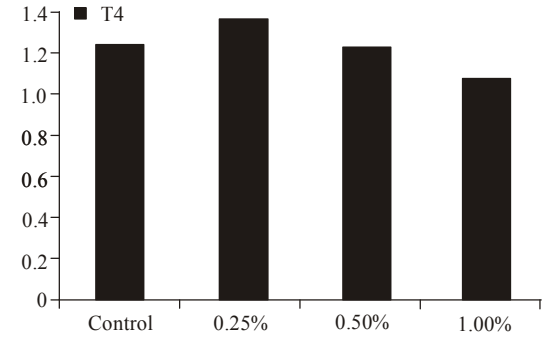

Fig. 2: Mean comparison of T_4 hormone in studied groups

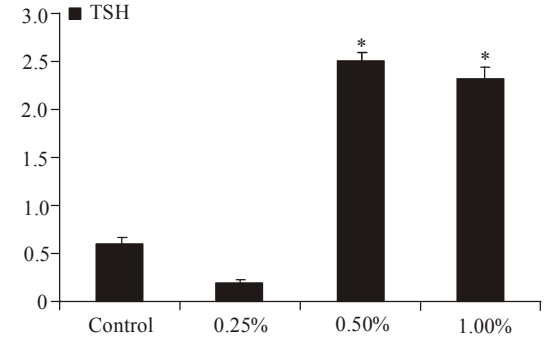

Fig. 3: Mean comparison of TSH hormone in studied groups

Obtained data were analyzed using SAS program and mean comparison was done using Duncan multiple ranges test.

RESULTS

There were significant differences ($p<0.05$) between T_3 hormone of high dose groups (third and fourth groups with 0.5 and 1% of extract) and control (Fig. 1) but according to results, T_4 amount of various groups was not different (Fig. 2).The level of TSH hormone was significantly different ($p<0.05$) in third and fourth groups and control group (Fig. 3).

DISCUSSION

Thyroid hormones (T_3 and T_4) are dividing from thyrosin amino acid. About 95% of thyroid secreting hormones are T_4 (thyroxin) whereas T_3 plays the main role. The main part of T_3 is obtained from converting T_4 to T_3in peripheral tissues like liver, kidney and placentum. Some tissues like brain and hypophysis can also convert T_4 to T_3 but obtained hormone can not be entered to blood and remains there. On the whole, 80% of blood's T_3 is made in liver and 20% in thyroid. Secreting Thyroid Stimulating Hormone (TSH) controls releasing thyroid hormones. The amount of TSH secreting is also adjusted by level of thyroid hormones in blood. By reduction in these hormones TSH secreting will be increased and then T_3 and T_4 secreting will be raised. Thyrothropine Releasing Hormone (TRH) secreted from hypothalamus adjusts TSH releasing from hypophysis somehow (Maleknia, 2004). In this study, TSH was increased significtly. Previous studies show that marshmallow's root extract can affect endocrine actions via releasing hypothalamus-hypopyhsis axis which is probably because of increase in TSH (Booth, 1998). Scientist have shown that extract of marshmallow's root can affect the action of hypophysis gland via controlling receptor conjunction and affect T_3, T_4 and TSH (Lau *et al*., 1991).

Considering that somatoacetatin secreting is increased by effect of insulin like factor type one (IGF-1) and it controls Thyrotropin Releasing Hormone (TRH), it can be a reason for reducing TSH amount but the extract could eliminate this controlling effect and TSH has been increased in follow. 5- Deiodinase enzyme is an important regulator for T_3 production and studies have shown that somatoacetatin controls activity of this liver enzyme and has controlling effect on T_3 amount in serum (Gavin and Moeller, 1983). Then we can say that the extract of marshmallows root causes more stimulation of somatoacetatin to control this enzyme and reduction in T_3 at last. Thyroxin (T_4) and Triiodothyronin hormones play basic role in energy metabolism and their level in blood determine the amount of basic metabolism (Blum and Kunz, 1981). So, considering the reduction in T_3 amount in third and fouthgroups it seems that basic metabolism has been reduced and then, for preventing this reduction TSH amount has been increased by stimulating negative feedback to save basic metabolism.

Thyroid hormones affect development of blood cells. Most of the time there is an intermediate like a blood producing factor. Thyroid hormones stimulate blood producing by various strategies is which erythropoitin is the most important one (Antonijevic *et al*., 1999; Lukesenburg, 2001). Laboratory and human experiments have shown that these hormones are effective in hemoglobin synthesis and also in eonverting embry type of hemoglobin to mature type (Antonijevic *et al*., 1999; Franzese *et al*., 1996) so; reduction in T_3 can have negative effects on growth and physiological acts like blood producing among growth period. Thyroid hormones sometimes affect bone marrow directly and sometimes via media (Lukesenburg, 2001; Ellen and Susan, 2005). Thus, application of marshmallow's root extract in 0.5 and 1% doses can have negative effects on T_3 of broilers which is compensated by increase in TSH.

REFERENCES

Antonijevic, N., M. Nesovic and R. Trbojevic, 1999. Anemia in hypothyroidism. Med. Pregl., 52(3-5): 136-40.

Aurthor, J.R. and G.J. Beckett, 1999. Thyroid function. Rev. Br. Med. Bull., 55: 658-68.

Batooli, H., 2002. Medicinal industrial and aromatic plants of Kashan. Proceeding of the National Symposium of Medicinal Plants. Kashan Research Center of agriculture, Natural Sources, Arid Area and Desert, pp: 88-9. (Persian)

Blum, J.W. and P. Kunz, 1981. Effects of fasting on thyroid hormone levels and kinetics of reversˉe triiodothyronine in cattle. Acta Endocrinol., 98: 234- 240.

Booth, N.H., 1998. Veterinary Pharmacologic and Therapetics. 6th Edn., Iowa State University Press.

Bradley, P.R., 1992. British Herbal Compendium: A Handbook of Scientific Information on Widely used Plant Drugs. British Herbal Medicine Association, Boamemouth, pp: 239.

Daza, F.J., R. Parrilla and A. Martin-Requero, 1997. Influence of thyroid status on hepatic alpha la drenoreceptorresponseivness. Am. J. Physiol., 237: 1065-1072.

Ellen, M. and J.M. Susan, 2005. The Blood in Hypothyroidism. In: Werner and Ingbars. The Thyroid. 9th Edn., Lippincott Williams and Wilkins, pp: 803-805.

Fisher, D.A., S. Hoath and J. Lakshmanan, 1982. The thyroid hormone effects on growth and development may be mediated by growth factors. Endocrinol. Exp., 16: 259-271.

Franzese, A., M. Salemo, A. Argenziano, C. Buongiovanni, R. Limauro and A. Tenore, 1996. Anemiain infants with congential hypothyroidism diagnosed byneonatal screening. J. Endocrinol. Invest., 19(9): 613-9.

Gavin, L.A. and M. Moeller, 1983. Somatostatin inhibits rat hepatic T_4-5' deiodinase, the effect is independent of the associated hypoinsulinemia. J. Clin. Invest., 72: 2020-2030.

Kar, A., S. Panda and S. Bharti, 2002. Relative efficacy of three medicinal plant extracts in the alteration of thyroid hormone concentrations in male mice. J. Ethnopharmacol., 81(2): 281-285.

Kardosova, A. and E. Machova, 2006. Antioxidant activity of medicinal plant polysaccharides. Fito Terapia, 77(5): 367-373.

Lau, Y.S., A.M. Camoratto, L.M. White and C.M. Moriarty, 1991. Effect of lead on TRH and GRF bind ing in rat anterior pituitary membranes. Toxicology, 68: 169-179.

Lukesenburg, H.S., 2001. Hematologic Endocrinology. In: Kennet, L. Becker (Ed.), Principle and Practice of Endocrinology and Metabolism. 3rd Edn., Lippincott-William and Wilkins Publishers, Philadelphia, pp: 1927-1936.

Maleknia, N., 2004. Thyroid Hormones Biosynthesis. Tehran University Publication, Tehran.

Mashhadian, N. and H. Rakhshandeh, 2005. Antimicrobial and antifungal effects of *Nigella sativa* extracts against *Staphylococcus aureus*, *Pseudomonas aeroginosa* and *Candida albicans.* Pakist. J. Med. Sci., 21(1): 47-52.

Mirhidar, H., 2002. Encyclopedia of Plant, Practical in Prevention and Treatment of Illness. Nashr va Farhang Islami, Tehran, pp: 111-15. (Persian)

Mistry, D., S. Atkin, H. Atkinson, S. Gunasekaran, D. Sylvester and A.S. Rigby, 2011. Predicting thyroxin requirements following total thyroidictomy. Clin. Endocrinol., 74(3): 384-387.

Ott, J., R. Promberger, F. Kober, N. Neuhold, M. Tea and J.C. Huber, 2011. Thyroiditis affects symptomload and quality of life unrelated to hypothyroidism: A prospective case-control study in women undergoing thyroidectomy for benign goiter. Thyroid, 21(2): 161-167.

Ozturk, B.T., H. Kerimoglu, O. Dikbas, H. Pekel and M.S. Gonen, 2009. Ocular changes in primary hypothyroidism. BMC Res. Not., 2(266): 1-7.

Pakravan, M., H. Abedinzadeh and J. Safaeepur, 2007. Comparative studies of mucilage cells in different organs in some species of malva, Althaea and Alcea. Pak. J. Biol. Sci., 10(15): 2603-5.

Panda, S. and A. Kar, 2006. Evaluation of the ant thyroid, ant oxidative and ant hyperglycemic activity of scopoletin from Aeglemarmelos leaves in hyperthyroid rats. Phytother. Res., 20(12): 1103-1105.

Razavi, M., 2003. Medicine Plant. Tehran Publication, Tehran, pp: 104. (Persian)

Sutovska, M., G. Nosalova, S. Franova and A. Kardosova, 2007. The antitussive activity of polysaccharids from *Althaea officinalis l*., *var Robusta*, *Arctium lappa L*, *var Herkules and Prunus persica L*, Batsch. Bratisl Lek Listy, 108(2): 93-9.

Wiekenden, A.D., R. Kaprielian, T.G. Parker, O.T. Jones and P.H. Backx, 1997. Effects of development and thyroid hormone on k channel gene expression in rat ventricle. J. Physiol., 504(pt2): 271-286.

Zargari, A., 2004. Medicinal Plants. Tehran University Publication, Tehran, pp: 356-52.

Zoobi, J. and A. Mohd, 2011. Three new compounds from the roots of *Althaea officinalis* L. Int. J. Res. Ayurveda Pharm., 2(3): 864-868.