



Morphometric Parameters Of Thyroid Gland, Liver, And Kidney On Administration Of Thyroxine Followed By Bauhinia Purpurea And Withania Somnifera In Female Albino Rats

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Article History	Abstract
Received on 21.10.2022 Accepted on 18.11.2022 Published on 09.12.2022	<p>Background: The use of herbs in traditional medicine is to support thyroid health and their major importance can benefit both hyperthyroidism and hypothyroidism. Objective: to study the morphometric parameters of the thyroid, liver, and kidney on administration of thyroxine followed by Bauhinia purpurea and Withania somnifera in animals. Materials and Methods: Thirty adult female Albino rats weighing 150-230 grams were used for the present study. The study protocol was approved by the Institutional Animal Ethical Committee (No.878/ac/05/CPCSEA/10/22) from Raghavendra Institute of Pharmaceutical Education & Research (RIPER), Anantapur, Andhra Pradesh. The animals were divided into 5 groups and each group consisted of 6 animals. The body weight of the animals and the weight of the organs like the thyroid, liver and kidney were recorded. Results: We observed significant body weight reduction (170.32 + 8.45) in animals treated with thyroxine (0.5 mg/kg b.w) alone group than control group animals (191.36+17.32) in the present study. The body weight was significantly increased (187.72+7.026) in rats treated with thyroxine (0.5 mg/kg b.w) followed by Bauhinia purpurea (150mg) and Withania somnifera (1000mg) when compared with thyroxine alone group (170.32 + 8.45) was noted. The weight of the thyroid gland was significantly reduced(18.13 + 1.12) in rats treated with thyroxine alone (0.5 mg/kg b.w) treated animals than the control group (23.96 + 1.41) in our study. We also noted that, there was a significant increase in the weight of the kidney and weight of the liver in thyroxine alone (0.5 mg/kg b.w) treated group (2.79+ 0.03; 9.14 + 0.13) than control group (2.01+ 0.07; 7.41+ 0.81) in the present study. Conclusion: The thyroxine-alone treated animals showed a significant reduction in the body weight of the animal and thyroid gland compared to other experimental and control groups, whereas liver and kidney weight was significantly increased in thyroxine-alone</p>

CC License CC-BY-NC-SA 4.0	treated animals than in control and other experimental groups. Key words: <i>body weight, kidney, liver, thyroid</i>
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Introduction

The hyperthyroidism is characterized by acceleration of both synthesis and catabolism of proteins leads to their metabolic disorders[1]. The hyperthyroidism occurs because of thyroid dysfunction due to over production of thyroid hormones[2]. The hormonal disorders affect the metabolic rate of the animals and lead to changes and disturbances in body weight of the animals directly and indirectly acts on thyroid sensitive organs[3].The long-term administration of thyroxine on thyroid and its sensitive organs produces free radicals due to oxidative stress[4]. Bauhinia purpurea leaf extract has anti-oxidant and anti-thyroid properties with its different flavonoids play a significant role against hyperthyroidism [5,6].The Combined effects of Bauhinia purpurea and ashwagandha extracts induced an increase in hepatic catalase activity, and suggested the hepatoprotective nature of the extracts in association with thyroid health[7]. The present study aimed to understand the morphometric changes in thyroid ,liver and kidney on administration of thyroxine followed by bauhinia purpurea and withania somnifera herbal extracts in female albino rats.

Materials and Methods

Thirty adult female Albino rats weighing 150-230 grams used for the present study. The animals are maintained under controlled conditions with room temperature (23+20 C), humidity (50+5%) and 12 hr light and dark cycle. The study protocol was approved by Institutional animal ethical committee (No.878/ac/05/CPCSEA/10/22) from Raghavendra Institute of Pharmaceutical Education & Research, Anantapur, Andhra Pradesh. The animals were divided into 5 groups and each group consists of 6 animals in our study i.e. Group-I: Control animals treating with normal saline; Group-II: Animals treated with Thyroxine (0.5 mg/kg b.w) for 2 Weeks; Group-III: Animals treated with Thyroxine (0.5mg/kg b.w) for 2 Weeks followed by Combined Extract of Bauhinia Purpurea+Withania Somnifera(75mg + 500mg) for 3 Weeks; Group-IV: Animals treated with Thyroxine(0.5 mg/kg b.w)for 2 Weeks followed by Combined Extract of Bauhinia Purpurea +Withania Somnifera(100mg+750 mg) for 3 Weeks; Group-V:Animals treated with Thyroxine(0.5 mg/kg b.w) for 2 Weeks followed by Combined Extract of Bauhinia Purpurea+Withania Somnifera(150 mg +1000mg) for 3 Weeks (Table 1). The body weight of the animals and weight of the organs like thyroid, liver and kidney were recorded on the final day of the experiment in the study.

Results

We observed significant body weight reduction (170.32 ± 8.45) in animals treated with thyroxine (0.5 mg/kg b.w) alone group than control group animals (191.36 ± 17.32) in the present study [Figure 1]. The body weight was significantly increased (187.72 ± 7.026) in rats treated with thyroxine (0.5 mg/kg b.w) followed by Bauhinia purpurea (150mg) and Withania somnifera (1000mg) when compared with thyroxine alone group (170.32 ± 8.45) was noted (Table 2). The weight of the thyroid gland was significantly reduced (18.13 ± 1.12) in rats treated with thyroxine alone (0.5 mg/kg b.w) treated animals than control group (23.96 ± 1.41) in our study [Figure 2]. The mean thyroid gland weight was increased in thyroxine (0.5 mg/kg b.w) followed by Bauhinia purpurea (150mg) and Withania somnifera (1000mg) treated animals(22.15 ± 0.75) than thyroxine alone (0.5 mg/kg b.w) treated animals (Table 3). We also noted that, there was significant increase in weight of the kidney and weight of the liver in thyroxine alone (0.5 mg/kg b.w) treated group (2.79 ± 0.03 ; 9.14 ± 0.13) than control group 2.01 ± 0.07 ; 7.41 ± 0.81 respectively in the present study [Figure 3]. There was mild increase in liver and kidney weight observed (Table 4&5) in thyroxine (0.5 mg/kg b.w) followed by Bauhinia purpurea (150mg) and Withania somnifera (1000mg) treated animals (7.86 ± 0.33 ; 2.55 ± 0.10) compared with control group in the present study [Figure 4].

Discussion

The long-term administration of thyroxine may lead to the development of hyperthyroid state in rats followed by increased basal metabolic rate play a significant role in diminution in body weight[8]. The significant reduction in body weight was observed in our study may be due to increased metabolic rate in the animals lead to reduced body weight of the animals. The findings agree with previous literature[9,10].The exogenous

thyroid hormone administration resulted in a rapid reduction of the weight of the thyroid gland. In our study, there was significant reduction in thyroid gland weight was noted. The alteration in size and weight of the thyroid gland may be due to physiological changes in thyroid and have significant role in weight of the thyroid on long term administration of thyroxine lead to diminished thyroid weight[11]. There was a significant increase in weight of the kidney and liver in thyroxine alone treated group than control group in the present study. The thyroxine induction possibly generates the stress in liver and kidney lead to hypertrophy of liver and kidney [12,13]. The increased weight of the kidney on thyroxine administration stimulates the activity of adrenals indirectly and stimulates the adrenocorticosteroids on kidney function and growth of the kidney[14]. The findings in our study agree with previous literature[13,14]. Majority of the studies suggest that thyroxine induces oxidative stress in different organs like kidney, liver led to increased weight of the organs, the same was noted in our study[4]. The *Bauhinia purpurea* and *withania somnifera* at different doses against thyroxine administration showed remarkable changes in regulation of body weight of the animals, thyroid gland weight, liver, and kidney weights may be due their anti-thyroid, antioxidant properties in management of thyroid health[4,15,16].

Conclusion

The thyroxine alone treated animals showed reduction in body weight and thyroid gland weight than other experimental and control group, whereas liver and kidney weight was significantly increased in thyroxine alone treated animals than control and other experimental groups.

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Conflict Interest: **NIL**

Tables/Legends

Table 1: Animal Grouping

S.No	Group	Number of animals	Dosage
1	Group-I	6	Control(0.9% NaCl saline as Vehicle)
2	Group-II	6	Thyroxine 0.5 mg/kg b.w *
3	Group-III	6	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 75mg +WS 500mg b.w (3 Weeks)**
4	Group-IV	6	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 100 mg +WS 750mg b.w (3 Weeks)**
5	Group-V	6	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 150mg +WS 1000mg b.w (3 Weeks)**

** Orally; * i.p: intraperitoneal, b.w: body weight; BP: Bauhinia Purpurea; WS: Withania Somnifera

Table 2: Effect of bauhinia purpurea followed by withania somnifera against thyroxine on body weight of the animals on the final day of the experiment

S.No	Group	Number of animals	Mean \pm SD (gm)
1	Control	6	191.36 \pm 17.32
2	Thyroxine 0.5 mg/kg b.w *	6	170.32 \pm 8.45
3	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 75mg +WS 500mg b.w (3 Weeks)**	6	177.04 \pm 7.19
4	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 100 mg +WS 750mg b.w (3 Weeks)**	6	183.44 \pm 9.99
5	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 150mg +WS 1000mg b.w (3 Weeks)**	6	187.72 \pm 7.026

** Orally; * i.p: intraperitoneal, b.w: body weight; BP: Bauhinia Purpurea; WS: Withania Somnifera
Values are expressed as mean \pm SD (n = 6)

Table 3: Effect of bauhinia purpurea followed by withania somnifera against thyroxine on Thyroid gland weight in animals on the final day of the experiment

S.No	Group	Number of animals	Mean \pm SD (mg)
1	Control	6	23.96 \pm 1.41
2	Thyroxine 0.5 mg/kg b.w *	6	18.13 \pm 1.12
3	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 75mg +WS 500mg b.w (3 Weeks)**	6	19.55 \pm 1.20
4	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 100 mg +WS 750mg b.w (3 Weeks)**	6	20.74 \pm 2.13
5	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 150mg +WS 1000mg b.w (3 Weeks)**	6	22.15 \pm 0.75

** Orally; * i.p: intraperitoneal, b.w: body weight; BP: Bauhinia Purpurea; WS: Withania Somnifera

Values are expressed as mean \pm SD (n = 6)

Table 4: Effect of bauhinia purpurea followed by withania somnifera against thyroxine on liver weight of the animals on the final day of the experiment

S.No	Group	Number of animals	Mean \pm SD (grams)
1	Control	6	7.41 \pm 0.81
2	Thyroxine 0.5 mg/kg b.w *	6	9.14 \pm 0.13
3	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 75mg +WS 500mg b.w (3 Weeks)**	6	7.49 \pm 0.39
4	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 100 mg +WS 750mg b.w (3 Weeks)**	6	7.60 \pm 0.53
5	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 150mg +WS 1000mg b.w (3 Weeks)**	6	7.86 \pm 0.33

** Orally; * i.p: intraperitoneal, b.w: body weight; BP: Bauhinia Purpurea; WS: Withania Somnifera

Values are expressed as mean \pm SD (n = 6)

Table 5: Effect of bauhinia purpurea followed by withania somnifera against thyroxine on kidney weight of the animals on the final day of the experiment

S.No	Group	Number of animals	Mean \pm SD (grams)
1	Control	6	2.01 \pm 0.07
2	Thyroxine 0.5 mg/kg b.w *	6	2.79 \pm 0.03
3	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 75mg +WS 500mg b.w (3 Weeks)**	6	2.49 \pm 0.18
4	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 100 mg +WS 750mg b.w (3 Weeks)**	6	2.46 \pm 0.12
5	Thyroxine 0.5 mg/kg b.w (2Weeks)* and BP 150mg +WS 1000mg b.w (3 Weeks)**	6	2.55 \pm 0.10

** Orally; * i.p: intraperitoneal, b.w: body weight; BP: Bauhinia Purpurea; WS: Withania Somnifera

Values are expressed as mean \pm SD (n = 6)

Figures

Figure 1: The Effect of bauhinia purpurea followed by withania somnifera against thyroxine on Body weight of the animals on the final day of the experiment

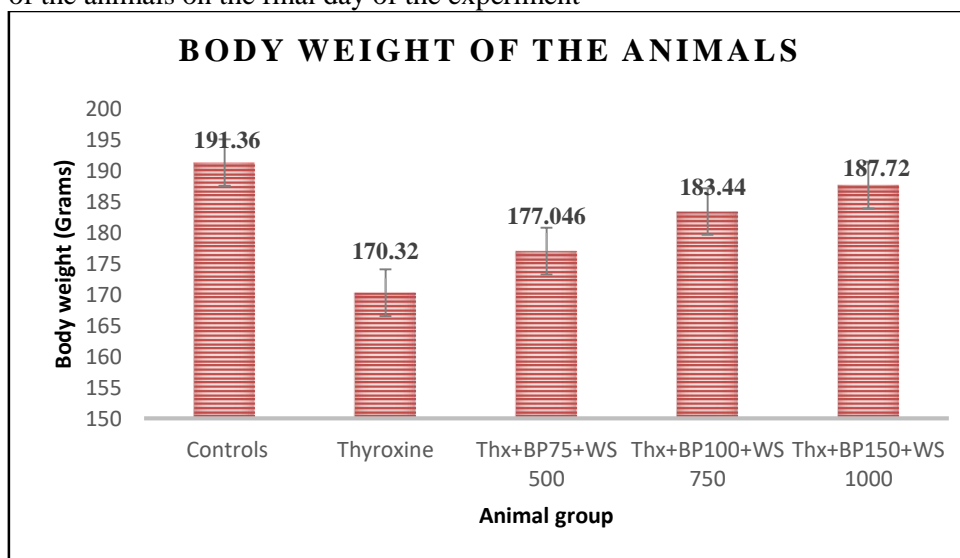


Figure 2: The Effect of bauhinia purpurea followed by withania somnifera against thyroxine on kidney weight of the animals on the final day of the experiment

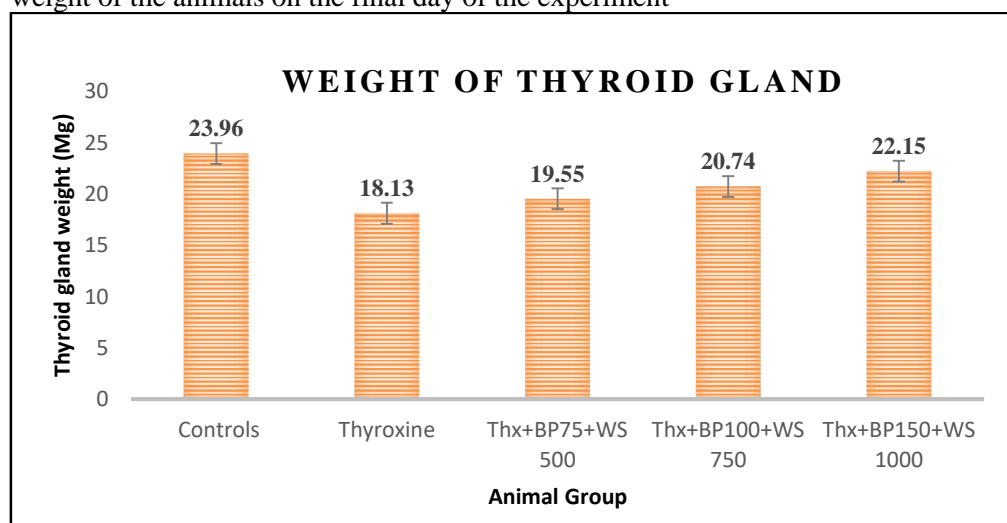


Figure 3: The effect of bauhinia purpurea followed by withania somnifera against thyroxine on Liver weight of the animals on the final day of the experiment

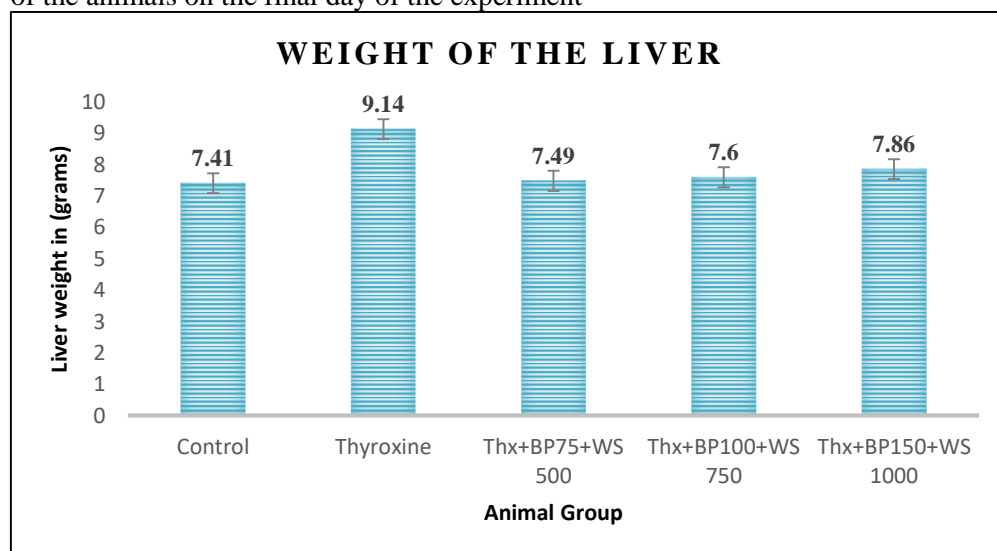


Figure 4: The effect of bauhinia purpurea followed by withania somnifera against thyroxine on kidney weight of the animals on the final day of the experiment

