A Preliminary Investigation of Turkesterone: It's Not Deca

Direct Original Research

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Open Access

RESEARCH DIRECTS in HEALTH SCIENCES

Published: August 30, 2024

Research Directs in Health Sciences: *2024, Volume 4 (Issue 1): 8*

ISSN: 2768-492X

Abstract

Introduction: It has been suggested that supplementation with turkesterone, a type of ecdysteroid, may have anabolic properties that promote improvements in body composition. Thus, the purpose of this investigation was to determine if four weeks of Turkesterone (500 mg daily dose) supplementation affected body composition in healthy males and females.

Methods: Thirty-one active males (n=14) and females (n=17) volunteered for this investigation. Research participants were assessed pre and four weeks post for body composition (i.e., dual-energy X-ray absorptiometry). After pre-testing, they were randomized into a placebo (rice flour) or treatment group (i.e., 500 mg per day of turkesterone [Ajuga Extract]). Subjects were instructed to maintain the same diet and exercise habits during the study.

Results: The delta scores of the treatment and placebo groups were compared using an independent samples t-test. There were no between-group differences ($p>0.05$) at baseline for age, height, or body mass. There were no between-group differences in the delta score between the turkesterone and placebo groups in body mass ($p=0.38$), lean body mass ($p=0.68$), fat mass ($p=0.06$), or percent body fat ($p=0.14$); (Delta score, mean±SD: body mass kg – treatment -0.4±1.8, placebo 0.1±1.8; lean body mass kg - treatment -0.6±1.4, placebo -0.3±1.7; fat mass kg - treatment 0.1±0.6, placebo 0.5±0.6, % fat treatment 0.3±0.6, placebo 0.7±0.9).

Conclusions: Four weeks of supplementation with 500 mg of turkesterone did not affect body composition in active, healthy males and females.

Key Words: testosterone, muscle, steroid

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Introduction

Turkesterone is a plant-derived ecdysteroid compound with an 11alpha-hydroxyl group [1]. Ecdysteroids are a type of steroid hormone found in arthropods (such as insects and crustaceans) and some plants; these hormones play crucial roles in regulating various biological processes, particularly growth, development, and molting (the shedding of the outer exoskeleton to allow for growth) [1]. Despite the speculation that turkesterone exerts anabolic properties in humans ([2]), there are no studies that have supported this notion. Protein synthesis in liver tissue, both in live organisms and in controlled laboratory conditions, experienced a boost when mice were administered either phytoecdizone or turkesterone (0.5 mg/100 g) or the anabolic steroid compound nerobole (1 mg/100 g) [3]. Moreover, in both C2C12 murine myotubes and human primary myotubes, phytoecdysteroids enhanced protein synthesis by as much as 20%. In vivo experiments showed that ecdysteroids boosted rat grip strength [4]. Isenmann et al. conducted a 10-week randomized controlled trial involving strength training for young men (n=46). Various doses of ecdysterone-containing supplements were administered to assess their performance-enhancing effects [5]. Notably, the research participants supplemented with high-dose ecdysterone (i.e., 48 mg of ecdysterone) showed a significant increase in muscle mass (2.0 kg delta) [5]. Nonetheless, human data

regarding the ecdysteroid category of supplements is rare. Thus, this study sought to assess the impact of four weeks of turkesterone supplementation, a specific type of ecdysteroid, among a cohort of healthy young men and women.

Scientific Methods

Participants
Thirty-one active individuals (n=31, 14 male, 17 female) volunteered for this randomized, double-blind, placebo-controlled trial (Figure 1). The university's Institutional Review Board (IRB# 2023-575, Nova Southeastern University) approved all procedures involving human subjects, following the principles outlined in the Helsinki Declaration. Written informed consent was obtained from all participants before their involvement.

Supplementation
The research participants were randomized into a treatment or placebo group. The randomization was systematic in that every other research participant was assigned to a different group. For example, subjects 1, 3, and 5 would be assigned to Group A, whereas subjects 2, 4, and 6 would be assigned to Group B. For four weeks, the treatment group consumed 500 mg daily of turkesterone (i.e., Ajuga Extract; provided by Nutrition Formulators, Miramar, FL), whereas the placebo group consumed an identical-looking capsule filled with rice flour. Compliance with the supplement regimen was determined via a pill count at the termination of the investigation.

Statistical Analysis
Statistical analyses were performed using GraphPad (Prism 10) statistical software. The data are expressed as mean ± standard deviation (SD). Paired t-tests were employed to compare baseline and post-test scores within each group. Furthermore, an unpaired t-test was used to compare the groups' delta scores. A significance level of $p<0.05$ was deemed statistically significant.

Results
There were no significant differences at baseline between the turkesterone and placebo groups (Table 1).

Table 1. Baseline characteristics of the research participants.

	Turkesterone n=5 male, n=10 female	Placebo n=9 male, 7 female	p value
Age years	26±7	23±2	0.7691
Height cm	181.4±12.3	177.9±7.7	0.2624
Body Mass kg	69.5±16.8	78.1±19.1	0.1937

Data are expressed as the mean±SD. There were no between group differences at baseline. Legend: cm – centimeters; kg - kilograms

In addition, turkesterone supplementation had no effect on body composition (Table 2, and Figures 1-4).

Table 2. Body composition.

	Turkesterone			Placebo			p-value Delta
	Pre	Post	Delta	Pre	Post	Delta	
BM kg	69.5±16.8	70.2±17.0	-0.4±1.8	78.1±19.1	78.2±18.8	0.1±1.8	0.3834
LBM kg	49.5±15.7	48.9±16.1	-0.6±1.4	53.514.0	53.214.5	-0.31.7	0.6807
FM kg	17.3±5.9	17.4±5.8	0.1±0.6	21.8±7.9	22.2±7.6*	0.5±0.6	0.0630
% Fat	25.6±8.5	25.9±8.3	0.3±0.6	27.9±6.9	28.6±7.2*	0.7±0.9	0.1356

Data are expressed as the mean±SD. Legend: BM – body mass, FM – fat mass, LBM – lean body mass. There were no significant differences pre versus post for the turkesterone group (BM p=0.7685; LBM p=0.1521; FM p=0.4700; % Fat p=0.0845). There were no significant differences pre versus post in the placebo group except for FM* (p=0.0084) and % Fat* (p=0.0051) (BM p=0.3843; LBM p=0.2350). However, there were no between-group differences in the delta score for BM, LBM, FM, and % Fat.

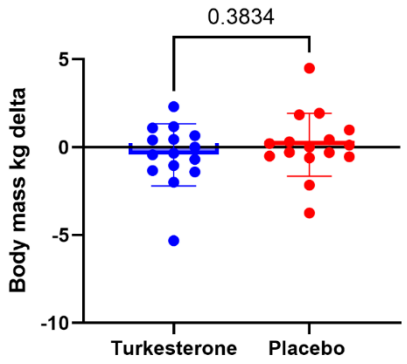

Figure 1. This figure represents the delta score regarding body mass in the treatment vs. placebo groups. The circles represent individual data points. The data is presented as the mean and SD (i.e., the middle horizontal line is the mean; the shorter horizontal lines above and below the mean are the SD).

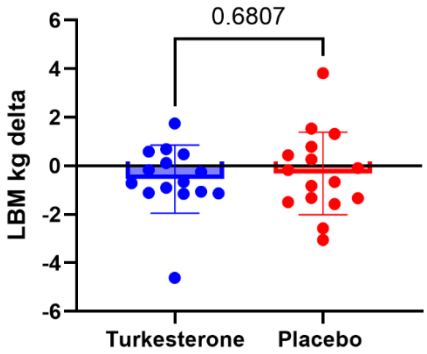

Figure 2. This figure represents the delta score regarding lean body mass in the treatment vs. placebo groups. The circles represent individual data points. The data is presented as the mean and SD (i.e., the middle horizontal line is the mean; the shorter horizontal lines above and below the mean are the SD).

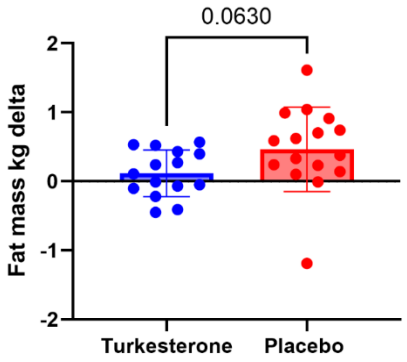

Figure 3. This figure represents the delta score regarding fat mass in the treatment vs. placebo groups. The circles represent individual data points. The data is presented as the mean and SD (i.e., the middle horizontal line is the mean; the shorter horizontal lines above and below the mean are the SD).

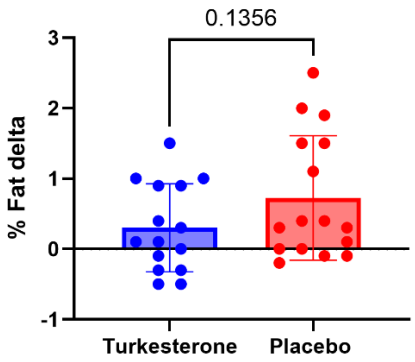

Figure 4. This figure represents the delta score regarding the percent fat in the treatment vs. placebo groups. The circles represent individual data points. The data is presented as the mean and SD (i.e., the middle horizontal line is the mean; the shorter horizontal lines above and below the mean are the SD).

Discussion

The current investigation is the first to assess the effects of turkesterone, a type of ecdysteroid, on humans. We discovered that within the investigation's parameters (i.e., four weeks of supplementing with 500 mg daily), turkesterone had no physiologic effect. Moreover, there is a scarcity of studies regarding turkesterone using animal models [6-9]. Turkesterone purportedly has anti-adipogenic activity in human adipocytes [9] and may increase the adaptation capacity of mice under stressful conditions [8]. Work from Mamatkhanov et al. suggests that turkesterone possesses anabolic activity in rat skeletal muscle [7].

It has been posited that ecdysterones, a naturally occurring ecdysteroid, can enhance training adaptations during resistance training. Supporting this, research in animal models has shown that ecdysterone supplementation can promote anabolic activity in skeletal muscle and increase cell proliferation and growth, leading to increased skeletal muscle mass [10,11]. In one of the few human trials, Simikan examined the effects of ecdysterone on muscle mass, fat mass, and hormonal changes. Seventy-eight highly trained male and female athletes participated in the study, divided into three groups: protein, protein and ecdysterone, and placebo. The protein-only group showed a slight increase in muscle mass over 10 days, while the placebo group experienced a slight reduction in lean muscle. The group taking ecdysterone with protein experienced a 6-7% increase in lean muscle tissue and nearly a 10% reduction in fat [12]. The fact that muscle mass increased and fat mass decreased in an exceedingly short time frame is not plausible and therefore, this casts doubt on the validity of the study. Nevertheless, it is one of the few studies in humans that have assessed the effect of an ecdysterone. Our investigation is the first to assess the effects of turkesterone on body composition in humans. We found that consuming 500 mg of turkesterone daily for four weeks did not affect body composition. Due to the lack of human data on this supplement, it is impossible to compare our investigation to others. Nonetheless, we can make comparisons to human trials that have used other ecdysteroids [5,13,14].

In one study, slightly overweight men and women consumed 50 mg of Ecdysone and 450 mg of spinach powder twice daily [14]This regimen significantly reduced body weight by 1.3%, waist circumference by 3.1%, and total body fat by 7.6%, while muscle mass increased by 2.9%. Additionally, C-reactive protein decreased by 38%, leading to reductions in serum cholesterol by 17% and triglycerides by 37%. It is important to note that this study was only published as an abstract and not as a full paper. In an intriguing investigation by Isenmann et al., they conducted a 10-week strength training intervention on young men (n=46) [5] concomitant with ecdysterone supplementation at a low and high dose. In this investigation, subjects were divided into one of four groups: placebo + training, ecdysterone (two capsules daily) + training, ecdysterone (eight capsules daily), or control (two capsules daily but no training). The training regimen included three sessions per week comprised of six barbell exercises targeting the entire body. Every training day was followed by a rest day. During weeks 1-6, participants performed three sets of 12 repetitions for each exercise. After week 6, this changed to three sets of eight repetitions. Under the supervision of the investigators, participants increased their training weights by 2.5–5 kg weekly, except during the recovery weeks (weeks four and seven), starting at an

intensity of 70% of their one-repetition maximum (1-RM). In addition to body composition, they assessed muscular strength. Regarding muscle mass, there was a significant difference in the delta between the higher dose ecdysterone group versus the placebo. There were no significant differences between any of the other groups regarding the delta score. However, these data are questionable because the placebo group experienced a slight decrease in muscle mass even though they were training. A 10-week strength training intervention should produce an increase in lean body mass; thus, it is puzzling why no training effect was found. Moreover, both the low and high-dose ecdysterone groups experienced significantly greater increases in bench press strength compared to the placebo with no difference between the two ecdysterone groups. Nonetheless, this study does suggest that with this particular ecdysteroid, there may be potential anabolic and performance-enhancing effects [5].

In contrast, Wilborn et al. examined the effects of methoxyisoflavone, 20-hydroxyecdysone (E), and sulfo-polysaccharide (CSP3) on strength and muscle mass [15]. Forty-five resistance-trained males (average age 20.5 years, height 179 cm, weight 84 kg, body fat 17.3%) were matched based on fat-free mass (FFM) and randomly assigned, in a double-blind manner, to receive either a placebo (P), 800 mg/day of methoxyisoflavone, 200 mg/day of 20-hydroxyecdysone, or 1,000 mg/day of sulfur-polysaccharide for 8 weeks during their training. At 0, 4, and 8 weeks, participants provided fasting blood samples and underwent assessments for muscular strength, muscular endurance, anaerobic capacity, and body composition. No significant differences were found among the groups in training adaptations regarding fat-free mass, body fat percentage, bench press strength, leg press strength, or sprint peak power. Additionally, anabolic/catabolic analysis showed no significant differences among the groups in active testosterone (AT), free testosterone (FT), cortisol, the AT to cortisol ratio, urea nitrogen, creatinine, or the blood urea nitrogen to creatinine ratio.

There are a myriad of reasons why turkesterone may not have any ergogenic effect as it pertains to this investigation. It should be emphasized that this is the only human study to date on turkesterone; thus, additional human clinical trials are needed. Moreover, even if turkesterone has anabolic effects in vitro or in animal studies, it may not be effectively absorbed or utilized by the human body. The bioavailability of turkesterone is unclear. Furthermore, despite turkesterone having a similar structure to other steroids, it may not interact with human androgen receptors in the same way. And lastly, the perceived benefits of turkesterone may in part be attributed to the placebo effect. Individual responses to supplements can vary widely due to genetics, diet, training regimen, and other lifestyle factors.

Conclusions

The strength of our investigation is that the participants were young, healthy men and women. It is the first and currently only study on turkesterone in humans. However, future work should perhaps examine a longer treatment duration and control for the type of exercise performed by the research participants. Nevertheless, based on the current investigation, there is no evidence that turkesterone supplementation improves body composition.

Acknowledgements

This study was funded in part by an in-kind donation of the product and placebo from Nutrition Formulators, Miramar Florida.

Institutional Review Board Statement

All procedures involving human subjects were approved by the university's Institutional Review Board (IRB# 2023-575, Nova Southeastern University), following the principles outlined in the Helsinki Declaration.

Informed Consent Statement

Written informed consent was obtained from all participants before their involvement.

Conflicts of Interest

JA is the CEO and co-founder of the International Society of Sports Nutrition (ISSN), a 501c3 non-profit that receives grant support from companies that manufacture, market, and sell dietary supplements. All other authors have no COIs to disclose.

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