The effect of Ashwagandha (Withania Somnifera) on anaerobic performance on elite Indian cyclist

Shweta Shenoy1, Udeesh Chaskar Bhaskaran1, Jaspal Singh Sandhu1, M.M. Paadhi2
1 Faculty of Sports Medicine and Physiotherapy, Guru Nanak Dev University, Amritsar, India
2 Central Council for Research in Ayurvedic Sciences (CCRAS), India

Abstract. Aims and objective. This study was formulated to study the effects of Ashwagandha on anaerobic parameters on the elite Indian cyclist. Material and Method. It is an experimental study design developed at department of sports medicine and physiotherapy, Guru Nanak Dev University (Amritsar India), on 40 elite cyclists were randomly selected and equally assigned into two groups viz experimental and control group. The experimental group was given supplementation of aqueous roots of Ashwagandha extracts, in the form of capsules while the placebo group was given starch capsules for 8 weeks. Outcome measures: parameters of anaerobic power included were watts, peak power, average power measured by Kinematic Motion System analysis and velocity was measured by 50 meters dash test.

Results. There was significant improvement in both males and females in all the parameters. Watts (P<0.001), peak power (P<0.05), average power (P<0.05) however there was no statistically significant improvement in velocity but it should a clinically significant improvement. Males and females were equally responsive to the ashwagandha supplementation. Conclusion: 8 weeks supplementation of ashwagandha leads to improvement in the anaerobic capacity of elite cyclist.

Key words: anaerobic performance, Ashwagandha, elite Indian cyclist.

Introduction
Anaerobic system is a short-burst of energy system lasting for 0-30 seconds. This energy system produces energy in the form of adenosine triphosphates (ATP), which refers to the energy currency that is utilized by muscle cells without the utilization of oxygen (1). Cycling is regarded as an endurance sports that mainly relies on the aerobic capacity for energy generation during sustained bouts (2). Though, the aerobic process supplies most of these adequate amounts of energy required in long lasting races, yet they do not provide adequate amounts of energy during strenuous exercise, in which conditions, the important energetic requirements are supplied by the anaerobic pathways (3).

This power production for the sprint dominance is crucial to these cyclists during the last minute of the race, wherein sprint power generated by the anaerobic energy system guides the cyclist through the finishing line and drives him to grab a podium finish (4).

Although everyone notes the importance of an aerobic power, yet till date we find no studies seconding this statement. Focusing towards winning a medal on the podium has influenced athletes to boost their performance, mainly relying on supplementations and various ergogenic aids (5). Although there is no shortcut to success, enhancing the power and capacity of the athlete to genetically determined upper limit is of great importance in the sports arena.

Ashwagandha is an ancient Indian ayurvedic herb that is predominantly found in the South Asians countries and has been known to possess several medicinal benefits (6). Among its numerous benefits, one of its main properties is that this herb improves overall vitality of an individual (7). A series of animal studies have demonstrated Ashwagandha to have profound effects on healthy production of white blood cells (WBC), referring it to an effective immuno-regulator and chemoprotective agent (8). This property is very much vital in sports, which directly contributes to the storage of anaerobic power of an athlete.

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Materials and Methods

Participants. 40 elite track and road cyclist (elite hereby refers to participation of the athlete in at least state level) Indian cyclists (20 males and 20 females) were randomly selected for this study from around Northern Punjab region. Sample size was obtained from the online sample size calculator; (www.stat.uwyo.edu), with the power of the study 0.8694 (13).

In order to participate in this study, subjects had to meet the following inclusion criteria; aged 18 to 27 years old, having at least state level medal winners in previous cycling competitions, not consuming any other dietary supplements or ergogenic aids during the entire study duration and subjects that had understood and agreed to undergo the following study.

The study was approved by the Guru Nanak Dev University’s Institutional Ethical Committee. Subjects were then randomly assigned into 2 groups: experimental (n = 20) which consumed Ashwagandha extracts capsules, and controlled (n = 20) which consumed placebo starch capsules. In which, both sexes; males and females were divided equally. During this study, three male subjects had been dropped out due to inconsistent attendance to training camps. One was belonging to the placebo group and another two from the experimental group.

Baseline Measures. Basic demographic data of each subject was recorded, which included age, sex, date of birth, personal best achievements (graded from scale 1-5), height (cm); using the stadiometer pole; precision of 1mm and weight (kg); using the Seca scale; precision of 0.1kg.

Assessment of Power. For these, the Kinematic Measuring System (KMS) from Fitness Technology; Australia was used to measure average power and absolute peak power of the lower limbs. The 40 cm box-jump test was used to get the average power and absolute peak power of lower limbs. The protocol used was the 30-second box jump test, whereby subjects were required to do a continuous jump from one end, to the top of the box, then landing on the other side of the box and finally returning to the beginning point. This had to be repeated non-stop for the duration of 30-seconds. Upon completion of the test, KMS will count the repetitions and display the total and segment count, total work done, average and peak power output (units displayed in Watts). Subjects were given 3 attempts, whereby the best reading of 3 trials were taken. Subjects were given an orientation session for the 40-cm box jump on a separate day, as well as 1–2 practice attempts, prior to the day of testing.

Assessment of Velocity. In this test procedure, the 50-meter Dash Test was used. Subjects were required to sprint a straight dash of a distance of 50-meters and the time (seconds; s)’ was recorded. Subjects were given 3 attempts, whereby the best reading of 3 trials were taken. Subjects were also given an orientation session before the start of the test, as well as 1–2 practice attempts.

Ashwagandha supplementation. The Ashwagandha (Withania Somnifera) used was in the form of standardized aqueous root extract, which was obtained in the form of capsules from Dabur India Ltd. In which, had been standardized to the In-House-Specific Ethions of Sanat Products Limited; which are the providers of Dabur India Ltd., certified by the Government of India, Ministry of Health and Family Welfare, Department of AYUSH; having the Purchase Order No. 4500579974, Challan No: 291, with the receipt No. 5000427895. The supplementation was filled in 500mg gelatin capsules. The capsules were given to all subjects in the experimental group, in an intervention of 8 weeks, with a dosage of 2 capsules (each capsule containing 500mg) daily; 1000mg/day (daily taken in the morning and evening).

Placebo supplementation. In this study, the control (Placebo) group was equally supplemented with placebo capsules containing starch powder for the duration of 8 weeks. These capsules were likewise prepared by the same company (Dabur India Ltd.), to avoid any disparities.

Statistical Analysis. Statistical analysis was performed using Microsoft Office 2011; Excel and Statistical Package for Social Sciences (SPSS) version 16.0. The Levene’s test was used to analyze the data for the level of significance. Relating values of ‘t’ test was used to find the effect of Ashwagandha on the anaerobic performance of the elite Indian cyclist.

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intrigroung and Levene’s was used to find intergroup differences in pre and post protocol. As for ‘t’ test of comparison between male vs. female, One-Way ANOVA and Post-Hoc Scheffe’s Test was used. The P value used for statistical significance was 0.05 for all cases and entire results are expressed as mean ± standard deviation (SD).

Results
With reference to Table I, the average age for this study was 20 ± 2 years for controlled and 19.6 ± 1.4 years for the experimental group.

Whereas mean height and weight was 56.6 ± 8.7 kg and 164.7 ± 6.6 cm for the controlled group, while the experimental group had the height and weight of 54.9 ± 7.1 kg and 167.39 ± 8.8 cm respectively. Results (Table II-IV) of experimental group revealed a statistical and clinically significant data; in watts, average power and peak power of lower limbs. However, as for velocity; in the 50-meter dash test, results had proved clinically significant, but not in statistically.

### Table I. Baseline Characteristics of Study Population

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Placebo group (n=19)*</th>
<th>Experimental group (n=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Min. 18 Max. 24.2</td>
<td>Min. 18 Max. 20 ± 2</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>45 80.6 ± 6 56.8 ± 8.7</td>
<td>47 70 54.9 ± 7.1</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>152 180 164.7 ± 6.6</td>
<td>148 188 167.4 ± 8.8</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>17.4 25.1 20.8 ± 2.5</td>
<td>16.2 23.5 19.6 ± 1.9</td>
</tr>
</tbody>
</table>

* having 1 drop-out; having 2 drop-outs

### Table II. Inter Group Comparison of Experimental vs. Placebo by Independent ‘t’ Test (Levene’s Test)

<table>
<thead>
<tr>
<th>Levene’s Test for Equality of Variances</th>
<th>t test for equality of means</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters</td>
<td>F Sig.</td>
<td>T</td>
<td>DF</td>
</tr>
<tr>
<td>Watts</td>
<td>1.870 180</td>
<td>5.631 35</td>
<td>.000</td>
</tr>
<tr>
<td>Average Power</td>
<td>.205 654</td>
<td>2.565 35</td>
<td>.015</td>
</tr>
<tr>
<td>Peak Power</td>
<td>6.680 014</td>
<td>2.225 35</td>
<td>.033</td>
</tr>
<tr>
<td>50 m Dash (seconds)</td>
<td>.390 536</td>
<td>1.574 35</td>
<td>.125</td>
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### Table III. Mean Values (±SD) of pre-post readings respective to experimental and placebo

<table>
<thead>
<tr>
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<th>Post-Test</th>
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<tr>
<td>Pre-Test</td>
<td>242.4 ± 53.8</td>
<td>297.8 ± 53.5</td>
<td>Watts</td>
<td>245.2 ± 33.3</td>
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<td>Post-Test</td>
<td>176.6 ± 45.8</td>
<td>198.41 ± 41.8</td>
<td>Average Power</td>
<td>151.6 ± 49.5</td>
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<td>Pre-Test</td>
<td>199.1 ± 44.7</td>
<td>211.3 ± 33.6</td>
<td>Peak Power</td>
<td>200.9 ± 27.2</td>
</tr>
<tr>
<td>Post-Test</td>
<td>8.7 ± 0.5</td>
<td>8.3 ± 0.5</td>
<td>50 m Dash (seconds)</td>
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Discussion and Conclusion

This paper aimed to study the effects of Ashwagandha on the anaerobic performance; which had thus shown a positive improvement towards the anaerobic variables, in-comparison of the experimental and placebo group. Though, the 50-meter dash did not show a statistical significant data, yet clinically there was an improvement of 6% that was from 8.7s pre-test to 8.2s post-test. Other variable that showed a significant improvement was; watts, which showed a significant data, with t = 5.631 (P<0.05). Where pre-test value was 242watts and post-test it had increased to 297 Watts. Average power and peak power, both indeed showed a positive data (P < 0.05), that which, t = 2.565 for average power and t = 2.225 for peak power. The mechanics behind how Ashwagandha exerts its effects remains largely unexplored. However, the increase in power could be hypothesized is due to the anabolic effects of this herb. A study done in 1994 by Grandhi et al (14) stated that this herb has shown to possess anabolic effects. It has been shown in several studies that it has effect in boosting the production of the Luteinizing hormone (LH), which also known as lutropin that is hormone produced by the anterior pituitary gland. LH acts in ovary in females and testicles in males. In females, LH is secreted by the theca cells of the ovaries, causes steroidogenesis and metabolism of the ovary as a whole and of the isolated follicle and its component cell types, the granulosa and thecal cells, as well as folliculogenesis and follicular growth, oocyte maturation, follicular rupture, and corpus luteum maintenance. In males, LH has been known to stimulate the Leydig cells, which are found in the testicles that produce androgens, including testosterone (15). Ashwagandha also has proved to possess a direct
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sporadogenic influence on the seminiferous tubules of immature rats presumably by exerting a testosterone-like effect (16). Testosterone and other androgens of Ashwagandha was also found in infertile males in a study done in 2010 (17). In the same study they found that the herb effectively reduces the oxidative stress as assessed by an improved levels of various antioxidants and inhibited lipid peroxidation and protein carbonyl content which would also have effect on increasing the levels of testosterone, LH and reduced the levels of FSH and prolactin in the infertile subjects used in the their study. Various studies have also demonstrated an increase in strength and power due to the increase in testosterone levels (18, 19).

We would like to acknowledge the Central Council for Research in Ayurveda and Siddha (CCRAS) and Dabur India Ltd. in the subsidization, preparation and standardization of the Ashwagandha capsules used in this research.

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