In Ayurveda, certain herbal formulas are considered to be rejuvenating. These formulas are called Rasáyana tonics Sharma PV (1999), and they are typically taken over long periods of time to regenerate both brain and body tissue. In rare cases an herb is so potent and has so many health benefits that Ayurveda considers it to be a Rasáyana therapy on its own, Ashwagandha is one such herb. It is considered as most important adaptogens in ayurvedic system of medicine. For centuries, Ayurvedic medicine has used the ashwagandha plant as an aphrodisiac, to remedy general weakness and exhaustion, as well as for its stress-relieving qualities. With an abundance of antioxidants, iron, amino acids, and other phytochemicals, it’s no surprise that studies suggest ashwagandha has medicinal properties that can directly and indirectly prevent and treat a number of diseases Agarwal R (1999).

Ashvagandha in Sanskrit means "smelling like a horse ", probably originating from the odor of its fresh root which resembles that of a sweaty horse. Ashvagandha is a well-known antistress herb. Ashwagandha is biologically known as Withania somnifera(WS). The species' name Somnifera means "sleep-bearing" in Latin, indicating that Ashvagandha was considered a sedative. However, it has also been used for sexual vitality and as an adaptogen. Ashvagandha is popularly known as Indian Ginseng because it is used to treat so many different conditions, just as ginseng is in Traditional Chinese Medicine. It is also known as Indian winter cherry - is a shrub cultivated in India and North America whose roots have been used for thousands of years by Ayurvedic practitioners. The root contains flavonoids and many active ingredients of the withanolide class Mishra at el. (2000).

Ashwagandha also appears to have antibacterial and antiviral properties of its own, even against multiple-drug resistant strains of these microbes Singh at el. (2011). Ashwagandha is an unique herb with antistress, adaptogenic action
that leads to better physical fitness and helps with stress management Singh at el. (2010). It increases physiological endurance and protects against the effects of stress Armen and Sandhu (2007). It is especially beneficial in stress-related disorders such as arthritis, hypertension, diabetes and premature aging Mishra at el. (2000). It works in suppressing pains of any sort, this property due to its ushan virya potency, which helps in eradicating vata that is the reason of initiation of pain in body. Works as anti-inflammatory substance therefore helps in reducing swellings and restoring blood supply Anabalgan and Sadique (1981). Relieves stress due to presence of vata suppressant properties which helps in nurturing nervous system, provides nourishment to the brain for its better function and greater ability to work. Improves mental ability, helps in gaining retaining power and improves mental concentration. A powerful aphrodisiac thereby helps in enhancing the sexual powers, increasing sperm count and also the quality of sperms Ahmad at el. (2010). Behaves as diuretic therefore is very helpful in treating urinary tract infections (UTI) further useful in upper respiratory tract infection (URTI) and in asthmatic condition. Withania somnifera have great antimicrobial potential against microorganisms Singh and Kumar (2011).

Aphale et al. (1998) reported in a study conducted on rats, intake of ginseng and ashwagandha for 90 days, researchers found significant increase in body weight, food consumption and liver weight, and improved hematopoiesis. They did not reveal any toxicity of brain, heart, lung, liver, spleen, kidneys, stomach, testis and ovaries. Further the side effects of WS were not significantly different from those experienced by placebo-treated individuals Cooley et al. (2009) and Chopra et al.(2004).Thus, ashwagandha probably is safe without serious side effects.

There are only few scientific clinical studies showing effect of WS on selective parameter of exercise performance after regular administration when given as supplements. The present study was therefore designed and performed to assess the effects of Withania Somnifera (Ashwagandha) on the VO2 max, Sprint Fatigue Level, Core Muscle Strength & Stability, Lower Back and
Hamstring Flexibility, Agility and concentration of hemoglobin in hockey players.

**Statement of the Problem**

*“Effect of Withania Somnifera (Ashwagandha) on the physical fitness components and physiological variables in hockey players”*

**Objectives**

1. To find out the difference in Maximal Oxygen Consumption Capacity ($VO_{2\text{max}}$ in ml/kg/min.) between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

2. To find out the difference in Sprint Fatigue Level between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

3. To find out the difference in Core Muscle Strength & Stability level between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

4. To find out the difference in Lower Back and Hamstring Flexibility level between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

5. To find out the difference in Agility level between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

6. To find out the difference in concentration of hemoglobin present in level between the control group (placebo group) and experimental group
(Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

**Hypothesis**

1. There will be no significant difference in Maximal Oxygen Consumption Capacity ($\text{VO}_{2\text{max}}$ in ml/kg/min.) between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

2. There will be no significant difference in Sprint Fatigue Level between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

3. There will be no significant difference in Core Muscle Strength & Stability level between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

4. There will be no significant difference in Lower Back and Hamstring Flexibility level between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

5. There will be no significant difference in Agility level between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

6. There will be no significant difference in concentration of hemoglobin present in level between the control group (placebo group) and experimental group (Withania Somnifera group) after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.
Delimitations

1. The study was confined to 48 male hockey players (between 16 to 19 years) from Shri Guru Hari Singh Hockey Academy, Shri Jiven Nager, Sirsa, Haryana.

2. Subjects were randomly into two Group I (n=24): Withania Somnifera Group (Experimental) and Group II (n=24): Placebo (Control) group.

3. Specific variables of Physical Fitness: a) Maximal Oxygen Consumption Capacity (VO_{2max}) in ml/kg/min. b) Sprint Fatigue Level c) Core Muscle Strength & Stability d) Lower Back and Hamstring Flexibility and e) Agility were studied.

4. Only one Physiological Variable: Haemoglobin Concentration in Blood was examined.

5. The control group (placebo group) and experimental group (Withania Somnifera group) were examined for different variables after 4 weeks and 8 weeks of placebo and Withania Somnifera supplementation.

Limitation of the study

The life style, habits, heredity, nutritional intake, physical fitness level, other psychological and physiological variables are beyond control of the research worker. These were considered as limiting factors of the study.

Selection of Subjects

The present randomized controlled, parallel group, single blinded study was conducted on forty eight male hockey players, with a mean age of 17.4 ± 1.7 (aged between 16 to 19 years) years and BMI 20.9 ± 2.9 kg/m^2 from Shri Guru Hari Singh Hockey Academy, Shri Jiven Nager, Sirsa, Haryana, who volunteered for the study. Subjects were randomly assigned into two groups using the chit in a box method, Group I (n=24): Withania Somnifera Group(Experimental) and Group II (n=24): Placebo (Control) group. Withania somnifera was used in the form of a standardized aqueous root extract was obtained from Central Council for Research in Ayurveda and Siddha (CCRAS), Delhi, India. Prior to the start of data collection, participants were explained about the drugs and previous research supporting the effectiveness on physical
performance and possible side effects due to overdose. Only then the subjects who volunteered to participate in the study were recruited. A written informed consent was taken from each participant and their parent prior to recruitment.

**Categorization of Subjects for Control and Experimental Group**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Category</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Withania Somnifera</em> Group (Experimental Group)</td>
<td>24</td>
</tr>
<tr>
<td>2.</td>
<td>Placebo Group (Control Group)</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>48</td>
</tr>
</tbody>
</table>

2. **Variables Studied**

In the present study effect of Ashwagandha supplementation on following specific variables of physical fitness and one physiological variable upon which performance of a hockey player is directly related were studied:

i) **Specific variables of Physical Fitness**

a) Maximal Oxygen Consumption Capacity ($\text{VO}_2\text{max}$) in ml/kg/min.

b) Sprint Fatigue Level

c) Core Muscle Strength & Stability

d) Lower Back and Hamstring Flexibility

e) Agility

ii) **Physiological Variable:** Haemoglobin Concentration in Blood

**Method of Ashwagandha Supplementation**

Quality and dose of *Withania Somnifera (WS)* known as Ashwagandha was decided after consultation with the Ayurvedic Medical Officer of Civil Hospital, Sirsa (Haryana). Who prescribed a dose of 500mg roots powder of *Withania Somnifera* (WS) for each subjects. *Withania Somnifora* was used in the form of a standardized aqueous root extract was obtained from Central
Council for Research in Ayurveda and Siddha (CCRAS), Delhi, India. The dose (500mg) as prescribed by the doctor and sugar power was filled in gelatin capsules and stored in air tight containers and in room temperature below 30°C throughout the experiment. Drug and sugar capsules were given to their respective groups (Experimental and Controlled) in the dose of 1 capsule/day orally with milk after meals at night for 8 weeks under the personal supervision of researcher. Subjects were unaware of which group they were in and which drug they were to receive. It was thus a single blinded study, where all the subjects were completely unaware of drugs which they were going to consume. Maximal Oxygen Consumption Capacity (VO$_{2\text{max}}$) in ml/kg/min, Sprint Fatigue Level, Core Muscle Strength & Stability, Flexibility, Agility and level of blood haemoglobin in both experimental and control groups were measured before and after administration of *Withania Somnifera* and placebo.

**Tool Used for the Collection of Data**

Following tools were used for the collection of data for different variables:

a) Maximal Oxygen Consumption Capacity (VO$_{2\text{max}}$) in ml/kg/min was measured with Cooper (1968) *12 min. run test* (VO$_{2\text{max}}$. = (22.351 x Distance run in km) - 11.288)

b) Sprint Fatigue Level was calculated with Mackenzie B. (2006) *40 Metre Multiple Sprint Test*.

c) Core Muscle Strength & Stability was assessed with Mackenzie B. (2002) *Core Muscle Strength and Stability Test*. Brian Mackenzie in 2002 developed Core Muscle Strength and Stability test to determine core strength. Hockey is a game which involves frequent high speed Zig-Zag movement with bend and straight torso. Thus good core strength indicates that for hockey a player can move with high efficiency.
d) Lower Back and Hamstring Flexibility was measured with Mackenzie B. (2000) *Sit and Reach Test.*

e) Agility of the subjects was evaluated with *Illinois Agility Run Test* Getchell (1979).

**ii) Physiological Variable**

Haemoglobin Concentration in Blood was measured with *HumaMeter Hb*⁺⁺ made by HUMAN Gesellschaft für Biochemica und Diagnostica mbH, Max-Planck-Ring 21 · 65205 Wiesbaden, Germany.

**Statistical Techniques Used**

The statistical tools are used to convert the quantitative data into qualitative responses, so that it may be easy to make the calculation and this process is known as quantification of data. In order to analyze the data in the present study the following statistical techniques were used manually as well as on computer: *Mean, Standard Deviation, Standard Error of Difference (S.E.D.) and t-Test.*

**Conclusions**

**1. Maximal Oxygen Uptake Capacity - VO₂max (ml/kg/min.):**

a) No significant improvement for VO₂max (ml/kg/min.) after 4 weeks and 8 weeks of placebo supplementation in the control group was found.

b) Supplementation of Ashwagandha (Withania Somnifera) for 4 weeks caused no significant improvement in the Withania Somnifera group (Experimental Group) for VO₂max (ml/kg/min.).

c) A significant improvement was found in the Withania Somnifera group (Experimental Group) for VO₂max (ml/kg/min.) after 8 weeks of Ashwagandha (Withania Somnifera) supplementation.

**2. Sprint Fatigue Level**

a) No significant improvement was found in the control group for Sprint Fatigue Level after 4 & 8 weeks of placebo supplementation.
b) No significant improvement was found in the Withania Somnifera group (Experimental Group) for Sprint Fatigue Level after supplementation of Ashwagandha (Withania Somnifera) for 4 weeks.

c) A significant improvement was found in the Withania Somnifera group (Experimental Group) for Sprint Fatigue Level after supplementation of Ashwagandha (Withania Somnifera) for 8 weeks.

3. **Core Muscle Strength & Stability**

a) No significant improvement after 4 & 8 weeks of placebo supplementation in the Core Muscle Strength & Stability was found.

b) A significant improvement was found in the Withania Somnifera group (Experimental Group) for Core Muscle Strength & Stability after 4 & 8 weeks of Ashwagandha (Withania Somnifera) supplementation.

4. **Lower Back and Hamstring Flexibility**

a) Improvement in the control group for Lower Back and Hamstring Flexibility after 4 & 8 weeks of placebo supplementation was found to be not significant.

b) No significant improvement was found in the Withania Somnifera group (Experimental Group) for Lower Back and Hamstring Flexibility after 4 & 8 weeks of Ashwagandha (Withania Somnifera) supplementation.

5. **Agility**

a) There was no significant improvement in the control group for agility after 4 & 8 weeks of placebo supplementation.

b) There was a significant improvement in the experimental group for agility after 4 & 8 weeks of Ashwagandha (Withania Somnifera) supplementation.

6. **Hemoglobin level**

a) No significant improvement was found in the control group for Hemoglobin level after 4 & 8 weeks of placebo supplementation.
b) No significant improvement was found in the experimental group for Hemoglobin level after 4 weeks of Ashwagandha (Withania Somnifera) supplementation.

c) A significant improvement was found in the Withania Somnifera group (Experimental Group) for Hemoglobin level after 8 weeks of Ashwagandha (Withania Somnifera) supplementation.