CHAPTER I
INTRODUCTION

Success in sports is primarily depend up on genetic endowment in athletes with morphologic, psychologic, physiologic and metabolic traits specific to performance characteristics vital to a particular sport. Such genetically-endowed athletes must also receive optimal training to increase physical power, enhance mental strength and provide a mechanical advantage. When humans compete one another either in war or in sports, the competitors, by definition, seek to achieve an advantage over opponent and frequently they use drugs and other performance enhancing substances to gain the upper hand. However, athletes often attempt to go beyond training and use substances and techniques, often referred to as ergogenics, in attempts to gain a competitive advantage. Pharmacological agents, such as anabolic steroids and amphetamines have been used in the past, but such practices by athletes have led to the establishment of anti-doping legislation and effective testing protocols to help deter their use. Thus, many athletes have turned to various dietary strategies, including the use of various dietary supplements (sports supplements), which they presume to be effective, safe and legal.

According to surveys, athletes are major consumers of supplements and an important target group for the multi billion dollar supplementary industry. Health food stores, supermarkets, sports stores and the internet provide access to an increasing number of products, that claim to prolong
endurance, enhance recovery, reduce body fat, increase muscle mass, minimize the risk of illness or achieve other goals that enhance sports performance. It is understandable that, the claims of improved performance are attractive to athletes and coaches in elite competition, where very small differences separate the winners from the rest of the competitor. Athletes provide each other with testimonials or hearsay about the benefits attributed to supplements and sports food. Many athletes fear that, their opponents might have a secret weapon and even in the absence of scientific evidence to support the claims for a certain supplement they often feel compelled to use the product to maintain a certain level of performance on the playing field.

Most of the sports scientist are interested in supplements and sports food, as a part of their search for new strategies to enhance training effect, recovery and performance during competition. Many scientists has undertaken applied sport nutrition research, which has helped to develop new products and investigate the specific ways in which these products can be used to optimize performance. Unfortunately, the many challenges in undertaking such research mean that, it is impossible to keep pace with the number of new products that appear in the market. Thus, the majority of products used by the athletes are either untested or has failed to leave expectations in the preliminary studies that have been conducted. Scientists have a belief that well controlled research should underpin the promotion of any sports nutrition practice and are understandably frustrated because the producers of supplements often make impressive claims about their products.
without adequate or, in some cases, any proof. In most of the countries, legislation regarding supplements or sports food is either minimal or un-enforced, allowing unsupported claims to flourish and products to be manufactured with little or no complaints to labeling and composition standards of which the athletes and coaches are unaware off.

The use of drugs and supplements by athletes to enhance performance and appearance is not new. The Berserkers of Norse Mythology used bufotein for stimulating effects. (Prokop, 1970). West Africans used *Cola acuminata* and *Cola nitida* for running competitions (Strauss and Curry, 1987). The ancient Greeks ate hallucinogenic mushrooms and sesame seeds to enhance performance (Wadler and Hainline, 1989). Roman gladiators used stimulants to overcome fatigue and injury (Wadler and Hainline, 1989). South American natives chewed coca leaves for centuries to increase endurance (Boje,1939; Hoberman,1992; Prokob,1970)

All nutrients essential for life are obtained from animal or plant food which we consume. Several nutrients are said to possess ergogenic potential for athletes under special circumstances for egs. carbohydrate loading for marathon runners. Other than essential nutrients, animal and plant food contain naturally occurring substances that are referred to respectively as zoo chemicals and phytochemicals (American Dietetic Association,1998). Herbs acts as a class of phytochemicals that may induce physiologic actions in the body conducive to enhanced physical performance.
In the last few decades, sports have gained tremendous popularity all over the globe. The popularity of sports is still increasing at a faster pace and this trend is likely to continue in the future also. If the history of modern Olympic Games is looked into, it can be seen that the number of sportive disciplines in which the competitions are held at Olympic Games has increased steadily.

The area of competitive sports has gained much publicity and importance than any other areas. It has its own structure and organization, cadre of functionaries and a science which exclusively deals with this area. The principal aim of competitive sports is to prepare sports persons for giving elite sports performance. The area of performance sports is not merely a glamorous area of sports, it also fulfills certain valuable social functions due to which, it has been accorded high importance all over the world. It contribute towards the all round development of personality and enhances the horizons of awareness among the competing sports persons, with regard to the fact that they are representing particular states or countries of their origin. It inculcates in the youth a fervent desire to excel, for which, they discipline themselves in order to carry out rigorous training over a number of years. International champions become models to be emulated by their people especially by the youth. They are considered as National heroes and Nations feel proud of them. People rejoice at their victories and feel sad when they lose and in fact victory or defeat of their sports persons or teams is perceived as the victory or defeat of the nation.
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Competitive sports aim at elite sports performances and for that the physical capacities of sports persons are developed to extreme limits, which normally does not happen in other areas of human activity. As a result, competitive sports yield valuable knowledge about the limit to which human performance and various performance factors can be developed. It also leads to discovery of means and methods for improving various physical capacities to exceptionally high levels and this knowledge is fruitfully applied to other areas of sports and human activity.

Elite sport performance is indeed an aspect of complex human performance which do have several aspect or dimensions. Hence, several disciplines of sports sciences are required to work in a coordinated manner to explore the nature of sports performance, in order to fasten the process of giving elite sports performance. Several disciplines of Sports Sciences have been established during the second half of the 20th century and they are Sports Medicine, Sports Physiology, Sports Nutrition, Sports Training, Sports Biomechanics, Sports Psychology etc.

Among the four stages of life, the youthful stage is the most attractive one with ample health, strength and endurance one can achieve many laurels in one’s life. But the fact is that, though it is the attractive stage of life which is short lived and cannot be brought back at any cost, the strength to fight against all odds including diseases comes down drastically. One of the reason for such a state is the improper nutrition i.e. intake of food. According to Nayak., (2000) it needs no emphasis that he/she who partakes compatible
food in proper quality and proper quantity and in time with a control over his/ her senses will not suffer from diseases.

Physical fitness is to the human body what fine tuning is to an engine. Fitness enables us to perform to our potential and can be described as a condition that helps us for a better look, pleasant feel and do our best. More specifically, it is the ability to perform daily tasks vigorously and alertly, with energy left over for enjoying leisure time activities and meeting emergency demands. It is the ability to endurance, to bear up, to withstand stress, to carry on in any circumstances where an unfit person could not continue, and is a major basis for good health and wellbeing.

Improving skill means that the performance of any motor task becomes more efficient, thereby reducing the time and level of effort required (Siedentop, 1994). Sports in the present world have become extremely competitive and it is not the mere participation or practice that brings out victory to an individual. Therefore, sports activities are influenced by various factors, like Physiology, Biomechanics, Sports Training, Sports Medicine etc. All coaches and trainers, Physical Education personnel and doctors are doing their level best to improve the performance of the players.

The Physical Health of the human beings depends not only upon different systems such as the circulatory, respiratory, digestive, reproductive, nervous etc., but also on different organs of the human body. Among these systems, the circulatory and respiratory systems are important ones, because these systems have a direct relation with human life and hence, the failure of
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these systems will be fatal. The main cause of a majority of pre-mature
deaths in America are Cardio-vascular diseases and many who survive these
diseases do have many limitations in their later lives.

Heart rate increases with exercise and hence increase is proportional to
the work load. Generally speaking, a physically fit individual will have lower
heart rate for a specified work load or in other words, at a given heart rate,
the trained individual will be able to exercise at a higher work load than an
untrained person.

Heart rate increases with oxygen consumption and hence is considered
to be the most valid measure of cardio-respiratory fitness and is utilized in
tests to predict oxygen consumption. Besides, heart rate provides a great deal
of information about the body’s reaction to exercise and is quick and easy to
measure. Hence, it serve as a valuable tool to monitor the strenuousness of an
exercise programme and provide a valid indictor of an individual’s
conditions in the measurement of cardio vascular fitness.

The Systolic Pressure of a trained person increases when he/she stands,
while it is not so in a poorly trained person and in fact may even decreases.
The heart rate, blood pressure and the breathing rate of an individual with
good physical condition returns to the pre-exercise levels more quickly after
exercise than at the rate an individual in a poor fitness condition.

Cholesterol is predominant in the form of plaques that clog up the
arteries as a result the coronary arteries may not be able to supply the oxygen
needed by the heart muscle. This inability to supply myocardial oxygen is likely to occur when more oxygen is needed.

High blood pressure or rather hyper tension is the most common cardio-vascular disease and is related to coronary heart disease. Hence, stroke is the result of obstruction of blood vessels in the brain due to hemorrhages caused by high blood pressure. Physical inactivity, low cardio-respiratory fitness, diabetes, smoking etc. are the basic reason for the poor performance of these survival activities of human beings.

Endurance is a conditional ability and is primarily determined by the energy liberation processes. Hence, the ability of the human body to maintain a certain level of energy production forms the Physiological basis of endurance. Due to the high importance of health, training and competition and also due to its physiological determinates, it has been studied in great depth by the Physiologists.

Sharkey, (1986) defines endurance as the ability to resist fatigue. Singh, (1993) also defined endurance as ability to resist fatigue. Endurance, a very important ability in sports is often overlooked in several sports. Endurance, a product of all psychic and physical organs and systems is very much different from other motor abilities and also depends so much on the working capacity of the complete psycho-physical apparatus of humans. All other performance factors do depends only on one or more parts of this psycho-physical apparatus and as a result are directly or indirectly affected by endurance.
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In sports, endurance ensures optimum speed or motor actions. The ability to maintain pace or tempo of an exercise during a competition is impossible without the requisite level of endurance. Good endurance also ensures high quality or skill of movement execution which finds expression in accuracy, precision, rhythm, consistency etc. Besides, under conditions of fatigue, the sports persons tends to lose motor co-ordination, concentration, mental alertness etc. and this clearly points out the importance of endurance for tactical efficiency. Apart from that, endurance activities have been found to be of high value for maintenance of good organic health, so as for increasing the general resistance against infection and for cure and treatment of various diseases and metabolic disorders.

Importance of Cardio - respiratory Endurance in Sports Performance:

An increased capacity to produce energy carrying oxygen is a prerequisite to many sports such as middle and long-distance running, cycling, rowing and swimming. Cardio-respiratory endurance is also important in team sports like football, basketball, soccer and rugby. Match analysis reveals that footballers have to cover distances of 7 to 11 km in a single game and match-play comprises of mostly low to moderate intensity activity with an average exercise intensity of 75% of maximum heart rate, and that heart rate exceeds 160 beats per minute for just 43% of the match play. Energy for activities at this level of intensity would predominantly be provided by the aerobic energy system. Most team games, including rugby and soccer are characterised as consisting of multiple high intensity bouts of
activity separated by periods of low to moderate activity. These high-intensity activities include sprints, jumps and tackle which are crucial to effective match performance. Although, these activities are fuelled by the anaerobic energy systems, researches have shown that, individuals with greater aerobic endurance require less recovery time in between repeated high intensity activities. Therefore, it is important to determine aerobic endurance in those sports because it is cardio- respiratory capacity that underpins the ability to play for 70 minutes and to recover between bouts of high intensity exercise.

To prevent the disease and to improve the health and/or physical fitness, different measures can be taken. Through the use of medicines or drugs the health can be preserved and there are different systems of medication viz. Allopathic, Ayurvedic, Homeopathic, Unani, Sidha, Naturopathic etc. India’s conventional form of treatment is Ayurveda, in which herbal plants and spices are the important ingredients, as these plants and spices are found to have magical powers not only to cure the diseases but also to develop positive health and to improve Physical fitness.

Hence, Ayurvedic medicines can be given both to patients and to healthy individuals simultaneously. In patients, they cure diseases and in healthy individuals they prevent diseases and promote positive health.

Ayurvedic System of Medicine

Ayurveda originated in India long back during the pre-vedic period from Vedas, the most ancient text which gives more information on health
and diseases than any other documented knowledge. Later, in due course of
time, Ayurveda said to be born out of intuition and revelation, developed into
a complete system of medicine. The term Ayurveda means ‘Science of Life’
and deals elaborately with measures for healthful living during the various
phases of the entire span of life. Besides, dealing with principles for
maintenance of health, it has also developed a wide range of therapeutic
measures to combat illness and these principles of positive health and
therapeutic measures relate to physical, mental, social and spiritual welfare of
human beings. This is one of the oldest formulated systems of medicine and
widely practiced in India, Nepal, Bangladesh, Sri Lanka and Pakistan.

The basic theories of Ayurveda arise from the concept of Tridosha,
that embraces the process of creation and evolution of Universe and laws of
life. The function of the body is considered to be the complementary work of
body, sense organs, mind and soul. Health in Ayurveda is defined as a well
balanced happy state of being free from diseases consisting of four folds i.e.
body, mind, external factors and natural intrinsic causes for which the
treatment is done by the use of drugs, diet and practices. Ayurveda consider
human beings in totality and in their relationship with the universe. Its
approach is that disease occurs due to imbalance in the equilibrium of three
doshas, restoration of which eliminates the disease and hence, it aims not only
in curing the disease but also enhancing the body vitality to combat the
disease and strengthen the immune system so that, the disease is automatically
cured or prevented. Apart from that, Ayurveda also gives due consideration to
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observation like daily routine, sleep, diet and gratification of senses. Thus, it can be said that, Ayurveda epitomizes the philosophy of complete and total healthcare and is not merely a medical science but is in fact a way of life.

Concepts and Principles of Ayurvedic System of Medicine:

According to Ayurveda, there are three basic constituents called Doshas in the physiological system and are the ultimate irreducible basic metabolic elements constituting the body and mind of living organisms. These Doshas are classified into Vata, Pitta and Kapha and correspond primarily to elements of air, fire and water which determine the life processes of growth and decay.

There are seven Dhatus or tissues in the body and they are: Rasa- body fluids, Rakta- blood, Mansa-muscular tissue, Meda- adipose tissue, Asthi- bone tissue, Majja- nerve tissue and bone marrow, and Shukra- generative tissue. There are also many waste products (Malas) in the body- stool, urine, sweat, nails, hair etc. Hence, according to Ayurveda health depends on a balanced state of all dhatus, doshas and malas both in quantity and quality.

Vata:

The biological air humour is called Vata, which is primarily dry, cold and light and is the most important or primary of three biological humours. Vata governs the other two and is responsible for all physical process in general and is said to sustain effort, exhalation, movement, equilibrium of tissues and coordination of senses. Vata is located in the colon, thighs, hips,
ear and bones and any increase in *Vata* causes debility, tremors, distention, constipation, insomnia and sensory disorientation.

**Pitta:**

The biological fire humour is called *Pitta* (bile) and is responsible for all the chemical and metabolic transformation in the body. *Pitta* exists in acid form and is essentially hot, moist and light and governs digestion, heat, visual perception, hunger, thirst, lusture, courage, stool, urine, eyes, skin, burning sensation and difficulty in sleeping. *Pitta* is located in the small intestine, stomach, sebaceous glands, blood and lymph and an increase in *Pitta* results in accumulation of internal heat or fever with inflammation and infection.

**Kapha:**

The biological water humour is called *Kapha* (phlegm) that holds things together and provides substances which gives support and makes up the bulk of bodily tissues. It also governs emotional traits, passion, patience and modesty and is primarily cold, moist and heavy. These are groups of enzymes which are responsible for digestion and metabolism in the body and gives stability, lubrication and holding together of joints. Excessive *Kapha* causes depression of the digestive fire, nausea, lethargy, heaviness, white colour, chills, cough, difficulty in breathing and excessive sleeping. Higher *Kapha* content in the body causes accumulation of weight and gravity in the body, inhibits normal function and causes hypoactivity because of tissue accumulation.
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According to Ayurveda, all objects in the universe including human body are composed of five basic elements called *Panchamahabhutas* namely, earth, water, fire, air and sky. There is a balance of these elements in different proportions to suit different structures and functions of the body and its parts. The tissues of the body are the structural entities, whereas, humours are the physiological entities, derived from different combinations of *Panchamahabhutas*. The food is considered to be basic building material of human body which gets processed into humours, body tissues and waste products and the equilibrium of humours is considered as to be healthy and any disturbances or imbalance leads to disease or sickness.

**Diagnosis:**

Ayurvedic methods of diagnosis are extremely simple. Stress is given on urine, stool, semen, vomiting, sneezing, yawning, hunger, thirst, tears, sleep or heavy breathing for diagnosis of a disease. It also stresses upon the use of a wholesome diet along with the use of drugs for successful treatment of diseases for which knowledge of the site of manifestation of the disease is also essential. Examination of the pulse is carried out with the help of radial artery and is carried out early in the morning when the patient is in empty stomach. The diagnosis examinations includes the following and they are examination of the urine, examination of the stool, general physical examination, examination of the tongue and eyes and examination of the skin and ear including tactile and auditory functions.

**Treatment:**
There are many different therapies applied in Ayurveda and can be grouped mainly into two as follows: (a) Tonification (Supplementation- make heavy) and (b) Reduction (Elimination- to lighten)

Reduction therapies decreases the body weight and are indicated for heavy weight, accumulation of toxins and aggravated or increased humours. It is indicated in acute stages of disease, when the attack is strong and primarily for Kapha. Tonification methods nourish deficiencies in body for chronic diseases and are indicated in debility or tissue weakness in which convalescence or after reduction methods have been used, primarily for Vata. Vata is treated by mild application of oils, mild sweating and purification methods, while mixed therapy is required for Pitta and is treated with the ingestion of ghee by purgation with sweet and cold herbs, by sweet, bitter and astringent food and herbs, by applying cool, delightful and fragrant essential oils, by amounting the heart with camphor, sandalwood, vetivert oils etc. On the other hand, Kapha is treated by strong emetic and purgation methods, by all kinds of exercises, by smoking of herbs and by doing physical hard work. Thus, treatment of diseases in Ayurveda is accomplished by any of the following methods:

(a) **Shamana therapy**: Elimination of vitiated doshas or humours is a process by which the vitiated dosha subsides or returns to normal without creating imbalance on other doshas is known as shamana. The administration of carminatives, digestives, creation of hunger or thirst, exercises and exposure to sun are classified under shamana therapy.


(b) **Shodhana therapy:** Emesis, purgation, enemas and blood letting come under *shodhana*. They are also called *Panchakarma*.

(c) **Surgical treatment:** Ayurveda advocates surgical treatment for those diseases which are not curable by medical treatment or in case where surgical treatment may provide immediate relief.

(d) **Diet:** Ayurveda lays emphasis on regulation of diet and other regimens as part of the treatment.

(e) **Drug sources:** In Ayurveda, drugs are classified depending on their taste, attributes, potencies, taste after digestion and therapeutic effect. In addition to single drugs, compound formulations are used for the treatment of diseases in the form of pills, powders, decoction, infusions, tinctures, alcoholic preparations, medicated ghee and fractional distillates. Several pharmaceutical processes are followed for the preparation of medicines for easy administration, making the products delicious to taste, easily digestible and assimilatable, therapeutically more efficacious, rendering them non toxic and more tolerable and for preservation for a long period of time. Ayurvedic drugs are administrated both externally in the form of ointments, dusting powders, collyrium, ear drops and eye drops and internally as tablets, pills, powders and syrups. Along with medicine, some regiments like sleep, walk, rest, physical excretion are also prescribed to the patient. Thus, herbal medicine play a major role in the treatment
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of vitiated *Vata, Pitta* and *Kapha* and some of the plants used in Ayurvedic system of medicine is given in Table 1:1.

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Ayurvedic Name</th>
<th>Part used</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Andrographis paniculata</em></td>
<td>Kalmegh</td>
<td>Leaves</td>
<td>Tonic, febrifuge, hepatic dysfunction</td>
</tr>
<tr>
<td><em>Aristolochia rotunda</em></td>
<td>Mudharaj</td>
<td>Tubers</td>
<td>Antitumour, antifertility</td>
</tr>
<tr>
<td><em>Artemisia indica</em></td>
<td>Nagdoona</td>
<td>Leaves</td>
<td>Antidiabetic</td>
</tr>
<tr>
<td><em>Bergenia ligulata</em></td>
<td>Pakhan bed</td>
<td>Root, leaves</td>
<td>Kidney stones, tuberculosis</td>
</tr>
<tr>
<td><em>Cassia absus</em></td>
<td>Chaksu</td>
<td>Seeds</td>
<td>Astringent, cathartic, ringworm</td>
</tr>
<tr>
<td><em>Cassia occidentalis</em></td>
<td>Kasundi</td>
<td>Seeds, leaves</td>
<td>Purgative, diuretic, tonic</td>
</tr>
<tr>
<td><em>Garcinia indica</em></td>
<td>Kokam</td>
<td>Oil</td>
<td>Skin diseases, cardio tonic</td>
</tr>
<tr>
<td><em>Hemidesmus indicus</em></td>
<td>Antamul</td>
<td>Root, whole plant</td>
<td>Fever, rheumatism</td>
</tr>
<tr>
<td><em>Mimosa pudica</em></td>
<td>Lajalu</td>
<td>Leaves, roots</td>
<td>Sores, piles, wounds</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>General weakness</td>
</tr>
<tr>
<td><em>Momordica chrantia</em></td>
<td>Karela</td>
<td>Leaves, root</td>
<td>Antidiabetic</td>
</tr>
<tr>
<td><em>Mucuna pruriens</em></td>
<td>Kiwachh</td>
<td>Seeds</td>
<td>Anthelmintic, astringent</td>
</tr>
<tr>
<td>Herb</td>
<td>Common Name</td>
<td>Part(s)</td>
<td>Uses</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------</td>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Nardosstachys jatamansii</td>
<td>Balcchar</td>
<td>Roots</td>
<td>Antiseptic, laxative, diuretic</td>
</tr>
<tr>
<td>Ocimum basilicum</td>
<td>Tulsi</td>
<td>Oil</td>
<td>Diaphoretic, carminative, skin diseases</td>
</tr>
<tr>
<td>Plumbago zeylanicum</td>
<td>Chitrek</td>
<td>Roots</td>
<td>Diaphoretic, abortificient</td>
</tr>
<tr>
<td>Saraca asoca</td>
<td>Ashoka</td>
<td>Bark</td>
<td>Rheumatism, urinary diseases</td>
</tr>
<tr>
<td>Taxus baccata</td>
<td>Talispatra</td>
<td>Leaves</td>
<td>Antispasmodic, aphrodisiac</td>
</tr>
<tr>
<td>Terminalia arjuna</td>
<td>Argun</td>
<td>Bark</td>
<td>Astringent, diuretic</td>
</tr>
<tr>
<td>Terminalia bellirica</td>
<td>Bahera</td>
<td>Fruits</td>
<td>Astringent, brain tonic, liver disorders</td>
</tr>
<tr>
<td>Tribulus terrestris</td>
<td>Chota gokhru</td>
<td>Fruits, roots</td>
<td>Diuretic, astringent, lithontriptic</td>
</tr>
<tr>
<td>Vitex agnus-castus</td>
<td>Rennuka</td>
<td>Leaves, roots</td>
<td>Laxative, galactogouge</td>
</tr>
<tr>
<td>Vitex negundo</td>
<td>Sambhalu</td>
<td>Fruits</td>
<td>Tonic, expectorant, febrifuge</td>
</tr>
<tr>
<td>Wrightia tinctoria</td>
<td>Inderjao</td>
<td>Root, bark</td>
<td>Flatulence, psoriasis</td>
</tr>
</tbody>
</table>

Herbs have been used throughout history to enhance physical performance, but, scientific scrutiny with controlled clinical trials has only been recently used to study such effects. The following herbs are currently used to enhance physical performance regardless of scientific evidence of effect: Chinese, Korean, and American ginsengs; Siberian ginseng, *mahuang* or Chinese *ephedra*; *ashwagandha*; *rhodiola*; *yohimbe*; *Cordyceps* fungus, *shilajit* or *mummio*; smilax; wild oats; *Muira puama*; *suma* (ecdysterone), saw palmetto berries; ß-sitosterol and other related sterols; and wild yams (diosgenin). Other herbs remain virtually untested. Future research on ergogenic effects of herbs should consider identity and amount of substance or presumed active ingredients administered, dose response, duration of test period, proper experimental controls, measurement of psychological and
physiological parameters (including antioxidant actions) and measurements of performance pertinent to intended uses.

Humans consume herbs to enhance their long-term endurance performance (e.g., in running, cycling, rowing, swimming, walking, dancing, aerobics, cross-country skiing, and mountain climbing), to induce muscular hypertrophy and strength (e.g., for bodybuilding, weight lifting, wrestling, strength sports, and track and field events) or to enhance performance in sport events, both skill sports and those that are recreational. Tradition, identity of ingredients, advertisements, personal endorsements, use by other athletes, and the desire to succeed represent the extent of validation for most herbs used for physical performance.

Currently in the United States, herbs can be defined as drugs, food or dietary supplements. The Dietary Supplement Health Education Act (DSHEA) of 1994, which amended the Food, Drug and Cosmetic Act of 1938, defines dietary supplements as certain food items intended to supplement the diet that are not represented as conventional food. Besides, herbs or other botanicals and their extracts or concentrates are specifically mentioned as dietary supplements. To subject to DSHEA regulations, the statement “dietary Supplement” must appear on the principal display panel. DSHEA allows claims of structure or function to be made for dietary supplement products but not food and are based on the manufacturer’s interpretation of the scientific literature limited either to effects of ingredients on the body’s structure or function or on a person’s health or well-being. A
disclaimer to the effect that the Food and Drug Administration has not evaluated claims is mandatory to be present on dietary supplement labels that make structural or functional claims. Besides, product manufacturers and distributors are required to keep substantiation on hand, derived from reliable and competent scientific research, usually reported in peer-reviewed articles and texts, for any claims. Although, herbs can be conventional food or drug, all of the herbs described in this review are available as dietary supplements in the United States. Distributors of herbal products are also under the jurisdiction of the Federal Trade Commission (FTC), which monitors advertising for truthful statements that do not mislead. FTC guidelines for substantiation differ from DSHEA guidelines, a fact that may produce confusion as new regulations are enforced. It is hoped that distributors of herbal dietary supplements will disclose factual information based on peer-reviewed scientific literature, as the DSHEA intended. Other countries classify herbs as food, drug or both. In Germany, some herbs are prescription drugs that have passed stringent safety and efficacy requirements, but these drugs (herbs) are also available without a prescription. Herbal medicines are described in the German Commission E. Monographs, (Blumenthal et. al. 1998.) recently translated into English by the American Botanical Council. Herbal drug products to treat cerebrovascular deficiency that are made from Ginkgo biloba leaf extracts are one of the most frequently prescribed drugs in Germany.

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The herbs used most commonly at present to enhance physical performance and reasons for their use by consumers are discussed here. Some herbs are classified as adaptogens, i.e. they assist normalization of body system functions altered by stress rather than exerting a stimulatory effect (Kleijnen and Knipschild, 1992). Persons who exercise often use adaptogens because exercise is considered as a form of stress. Various combinations of traditional Chinese herbs, traditional Indian (Ayurvedic) herbs or combinations of herbs are available in the market and targeted towards physical performance and are having lack of scientific substantiation and hence their use is found to be uncommon. Herbs are used to improve performance (both endurance and strength), improve recovery, maintain health during intense periods of exercise, build muscle mass and reduce body fat.

Herbs currently used to enhance physical performance

• **Arctic rose** (*Rhodiola crenulata, R. rosea*) Adaptogenic (antistress) properties, enhance occasional hypertension, endurance and strength.

• **Ashwagandha** (*Withania somnifera*) Adaptogenic (antistress) enhance endurance and strength.

• **Asian ginseng** (also Chinese, Korean) Adaptogenic (antistress) enhance possible adulteration with stimulant drugs.

• **Panax ginseng** endurance and strength contraindicated in hypertension.

• **Chinese ephedra** (mahuang) (*Ephedra sinica*) Central nervous system stimulant.
Cordyceps (Cordyceps sinensis) Adaptogenic (antistress) enhance endurance and strength.

Muira puama Testosterone-like effect (anabolic)

Ptychopetalum olacoides Saw palmetto berries (Serenoa repens) Testosterone-like effect.

Schizandra (wu-wie-tza) (Schisandra chinesis) Adaptogenic (antistress) enhance rare cases of appetite suppression, stomach upset.

Urticaria. Shilajit (mummio) Adaptogenic (antistress) enhance endurance and strength.

Siberian ginseng (ci-wu-jia) Adaptogenic (antistress) enhance rare cases of insomnia.

Eleutherococcus senticosus endurance and strength contraindicates in high blood pressure.

Smilax (sarsaparilla) Testosterone-like effect (anabolic) German Commission E warns of gastric irritation and temporary kidney impairment and potential drug interactions with hypnotics.

Suma (Pfaffia paniculata) Ecdysterone source, testosterone-like effect (anabolic)

Tribulus terrestris (Tribestan) increases testosterone (anabolic effects).

Wild oats (Avena sativa) (combined with nettle root) testosterone-like effect.

Wild yam, Mexican yam (Dioscorea villosa) Testosterone-like effect (anabolic).

Yohimbe (Pausinystalia yohimbe) adrenergic agonist, potentiate caffeine and not recommended for long-term use, increase male
performance. Contraindicated in liver and kidney diseases and in chronic inflammation of sexual organs or prostate gland.

Controlled studies of Asian ginsengs found improvements in exercise performance when most of the following conditions were true: use of standardized root extracts, study duration of eight week, daily dose of one gram dried root or equivalent, large number of subjects and older subjects. Improvements in muscular strength, maximal oxygen uptake, work capacity, fuel homeostasis, serum lactate, heart rate, visual and auditory reaction times, alertness and psychomotor skills have also been repeatedly documented. Siberian ginseng has shown mixed results. Mahuang, ephedrine and related alkaloids have not benefited physical performance except when combined with caffeine. Other herbs remain virtually untested. Future research on ergogenic effects of herbs should consider identity and amount of substance or presumed active ingredients administered, dose response, duration of test period, proper experimental controls, measurement of psychological and physiologic parameters (including antioxidant actions) and measurements of performance pertinent to intended uses.

This information explores the scientific evidence for use of herbs and herbal extracts as ergogenic aids for humans who exercise. For this purposes, herbs can be defined as plants or plant extracts ingested for other than caloric or culinary benefit. Despite their long tradition of use by physically active persons, herbs have seldom been studied scientifically as a possible aid to physical performance. This will stop short of considering the effects of purified or synthesized compounds found in plant food and
classified as essential nutrients such as β-carotene, tocopherol and ascorbate. This will not consider one of the most popular herbal extracts, caffeine, which has been studied extensively as an ergogenic aid, usually as the pure compound added to decaffeinated coffee so that doses are controlled. Caffeine has consistently shown ergogenic effects for both endurance and short-term exercise, as indicated by several reviews (Graham and Spriet, 1996). Only ginseng preparations and ephedrine alkaloids have only been studied repeatedly for their effects on human physical performance. Common physiologic measures of exercise which can consider performance as oxygen utilization, fuel homeostasis as well as several other measures of interest.

A variety of other herbs and herbal combinations have been used to enhance physical performance, but only a few have been tested on human clinical trials. Rationales for use of other herbs as well as herbs that have already been discussed. Other herbs generally fall into either of the two categories: 1) adaptogen or tonic (ginseng-like) or 2) anabolic (increase muscle mass). Tonic herbs are presumed to enhance aerobic performance and anabolic herbs are presumed to mimic or be converted in the body into anabolic steroids, mostly for use by bodybuilders and weightlifters. Although, anecdotal and testimonial “evidence” abounds, the rationale for use of other herbs is strictly hypothetical, conjectural or based on results of animal studies. *Shilajit* (*mummio*) is a tarry exudates from rock crevices found at high altitudes in the Himalayas and Caucasus mountains that is
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derived from long-term humification of *Euphorbia* and *Trifolium* (clover) plants (Ghosal, 1988). Eastern European weight lifters have been using *mummio* as part of an “herbal anabolic stack” to promote better strength, recovery and muscular hypertrophy. Traditional Ayurvedic use of *shilajit* as a tonic has some support from studies.

The investigator tries to find out the effect of ‘*Lakshadi*’ *Choornam* (powder) for the enhancement of Cardio-Respiratory Endurance. This drug was traditionally used in ayurveda (Iyyar) by Kottkkal Aryavaidya Sala for strengthening and for enhancing the functioning of the thoracic region where our heart and lung lies. The medicine is even now prepared in large quantities for the treatment of specific diseases.

The Lakshadi Choornam (Powder) contains:

1. ‘*Lakasha*’ *Cateria Lacca* or *Coccus Lacca* (Coccidian family)

   Synonyms : Laksha (Sanskrit), Lac (English), Gala (Bangali), Lakha (Gujarathi), Combarakku (Tamil) Etc.
   Taste (Rasa) : Astringent (Kasaya)
   Property (Guna) : Snigdha.
   Potency (Virya) : Cold (Sita)
   Effect on Tridosha : Pacifies Pitta and Kapha (Singh, 2007)

   Lac is a resinous substance usually of a reddish or dark brown colour, with a disagreeable smell and easily breakable with a cracking sound, deposited on the twigs of trees such as the Banyan, Croton, Acacia.
and Peepul, by a small insect called the Carteria Lacca. Insect attack the young branches of the above mentioned trees and fix themselves to the branches; the female insect after ovipositor is effected dies, giving out from her body a reddish liquid which solidifies and forms a crust about an inch thick round the branch attacked; others again affirm that the sting of the insect effects the sap or gum of the trees, which forms the Lac. (Nadkarni, 2005).

2. ‘Lajjalu’ Mimosa Pudicca Linn (Luguminoseae Family)

   Synonyms : Lajjalu, Namaskari (Sanskrit), Varaha (Karnataka), Humble Plant, Sensitive Plant (English) Total Vadi(Tamil), Thendermani (Malayalam), Lajalu (Hindi) Etc.

   Taste(Rasa) : Bitter(Tikta) and Astringent(Kasaya)

   Potency (Virya) : Cold

   Effect on Tridosa : Pacifies Pitta and Kapha.

   Mymosa Pudica is a diffuse under shrub 45-90cm long; stems and branches sparingly prickly and clothed with long week bristles from bulbous bases. Leaves are sensitive, petioles 2.5-5cm long, bristly; stipules 8cm long, acute and their rachises clothed with ascending bristles. Leaflets 12-20 pairs, base obliquely rounded and is distributed in tropical America and through out India. (Kirtikar and Basu, 2003).

STATEMENT OF THE PROBLEM
The purpose of the study is to analyze the effect of selected Ayurvedic-Herbal medicines on Cardio-respiratory Endurance performance.

**DELIMITATIONS**

1. The study will be delimited to three groups i.e. one experimental group, one placebo group and one control group.

2. The study will be further delimited to 45 subjects, 15 subjects in each group of 18-25 years of age.

3. The study will be further delimited to male Physical Education Students who are doing regular physical activity.

4. The study will be delimited to the following Ayurvedic-herbal medicine.

   - **“Lakshadi Choornam”** which contain
     - *Kolarakku*—Laksha-“Lassifer Lacca”*-Cocadian Family
     - *Thottavadi*—Lajjalu-“Mymosapudicca”*-Laguminoseae family

5. The study was further delimited to the assessment of the following variables.

**Biochemical Variables**

1. Hemoglobin
2. Blood sugar (fasting)
Introduction

3. Total Cholesterol

Physiological Variables

1. Resting Pulse Rate
2. Breath Holding Time
3. Respiratory Rate
4. Vital Capacity
5. Systolic Blood Pressure
6. Diastolic Blood Pressure and
7. Cardio-Respiratory Endurance
LIMITATIONS

1. The difference that exist among the subjects due to varied social, cultural and economic factors cannot be controlled and this is considered as a limitation of this study.

2. The lifestyle and family background of the subjects selected cannot be controlled and this is considered as another limitation of this study.

3. The environmental changes and climatic conditions during the treatment period were not considered for the study.

HYPOTHESIS

1. It is hypothesized that there will not be any significant difference among different groups on Cardio Respiratory-Endurance of athletes as a result of the administration of Ayurvedic-herbal medicine.

2. It is hypothesized that there will not be any significant difference among different groups on Hemoglobin of athletes as a result of the administration of Ayurvedic-herbal medicine.

3. It is hypothesized that there will not be any significant difference among different groups on Blood Sugar of athletes as a result of the administration of Ayurvedic-herbal medicine.

4. It is hypothesized that there will not be any significant difference among different groups on Total Cholesterol of athletes as a result of the administration of Ayurvedic-herbal medicine.
5. It is hypothesized that there will not be any significant difference among different groups on Resting Pulse Rate of athletes as a result of the administration of Ayurvedic-herbal medicine.

6. It is hypothesized that there will not be any significant difference among different groups on Breath Holding Time of athletes as a result of the administration of Ayurvedic-herbal medicine.

7. It is hypothesized that there will not be any significant difference among different groups on Vital Capacity of athletes as a result of the administration of Ayurvedic-herbal medicine.

8. It is hypothesized that there will not be any significant difference among different groups on Systolic Blood Pressure of athletes as a result of the administration of Ayurvedic-herbal medicine.

9. It is hypothesized that there will not be any significant difference among different groups on Diastolic Blood Pressure of athletes as a result of the administration of Ayurvedic-herbal medicine.

10. It is hypothesized that there will not be any significant difference among different groups on Respiratory Rate of athletes as a result of the administration of Ayurvedic-herbal medicine.

**DEFINITION AND EXPLANATION OF THE TERMS**

**Hemoglobin (Hb)**
Introduction

A protein in red blood cells that transports oxygen and carbon dioxide and gives blood it’s red color. (www.webmd.com)

Blood Sugar (fasting)

The concentration of glucose in the blood, measured in milligrams of glucose per 100 milliliters of blood after fasting (www.answers.com)

Cholesterol

A fatty substance in which carbon, hydrogen and oxygen atoms are arranged in rings. (Howely and Franks, 1997)

Resting Heart Rate

Resting Heart Rate is the number of times heart contracts in a minute while the body is at rest. (Hockey, 1985)
Introduction

Respiratory Rate

Respiratory Rate is the number of breaths taken in a minute or number of inspiration or expiration in a minute. (Fox and Mathews, 1981)

Breath Holding Time

Breath Holding Time is the duration of time through which an individual can hold the breath without inhaling or exhaling after a deep inhalation. (Strunkic, 1981)

Vital Capacity

The amount of air that can be forcibly expelled from the lungs after breathing in as deeply as possible. (www.answers.com)

Systolic Blood Pressure

Systolic Blood Pressure is the highest arterial pressure measured during a cardiac cycle. It is the pressure in the artery after blood has been ejected from the left ventricle. (Linda, 1998)

Diastolic Blood Pressure

Diastolic Blood Pressure is the lowest arterial pressure measured during a cardiac cycle and is the pressure in the artery during ventricular relaxation when no blood is being ejected from the left ventricle. (Linda, 1998)

Cardio-Respiratory Endurance
Introduction

Cardio-Respiratory Endurance is the ability of circulatory and respiratory systems to supply fuel during sustained physical activity. (Howely and Franks, 1997)

SIGNIFICANCE OF THE STUDY

Today’s world of sports has been highly intensified with much fierce competition, as a matter of fact, every athlete tries to show his/her best performance. Many depend upon some kind of drugs which gives them some additional benefits. Hence, the result of this study will enable the utilization of ancient Ayurvedic and Herbal Medicines by the athletes, so as to enhance their performances in sports and games, accordingly, the practical contribution of research findings of this study will have the following significant contributions.

1. The findings of this study could be helpful to reveal the effectiveness of Ayurvedic – Herbal Medicines for the increase of cardio-respiratory endurance performance of athletes.

2. The findings of this study will help Physical Education Teachers and Coaches to know about the effect of ‘Lakshadi Choornam’ on cardio respiratory endurance of athletes.

3. The findings of this study would add to the body of knowledge in the area of Sports Medicine and Exercise Physiology.

4. The findings of this study could be helpful to reveal the effectiveness of ‘Lakshadi Choornam’ on the biochemical variables of athletes.
5. The findings of this study could be helpful to reveal the effectiveness of ‘Lakshadi Choornam’ on Physiological variables of the athletes.