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PROJECT REPORT

ON

"STUDIES ON ANTIOXIDANT POTENCY OF *Solanum nigrum*"

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Submitted by

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1. INTRODUCTION

Solanum nigrum of family Solanaceae with common name Black Nightshade. The plant has many medicinal properties. The whole plant is antiperiodic, antiphlogistic, diaphoretic, diuretic, emollient, febrifuge, narcotic, purgative and sedative (Greeve, 1984). It is harvested in the autumn when both flowers and fruit are upon the plant, and is dried for later use (Greeve, 1984).The leaves, stems and roots are used externally as a poultice, wash etc in the treatment of cancerous sores, boils, leucoderma and wounds (Duke et al., 1985).

Extracts of the plant are found to be analgesic, antispasmodic, anti-inflammatory and vasodilator (Duke et al., 1985).The plant has been used in the manufacture of locally analgesic ointments and the juice of the fruit has been used as an analgesic for toothaches (Chiej,1984). This species has been found to be effective in removing PCB's from the soil and detoxifying them (Anderson, 1997). The plant is more effective in doing this if it is

infected with the bacterial paras Fruit – cooked (Polunin, 1987).Used in preserves, jams and pies (Facciola, 1990).A pleasant musky taste (Anderson, 1997). Somewhat like a tomato, but much less pleasant, it improves slightly after a frost. Only the fully ripe fruits should be used, the unripe fruits contain the toxin solanine (Facciola, 1990). The fruit contains about 2.5% protein, 0.6% fat, 5.6% carbohydrate, 1.2% ash (Reid, 1977). The fruit is about 9mm in diameter. Young leaves and new shoots - raw or cooked as a potherb or added to soups (Facciola, 1990). This plant is cultivated as a leaf crop in some areas.

Solanum nigrum is found to suppress the oxidative degradation of DNA in the tissue debris (Sarwat et al.,1995).The leaf extract of *S.nigrum* was found to have antioxidant function on immobilized stress induced rats (Tariq eta al.,2008). Study was done on the apoptotic effects of glycoprotein [*Solanum nigrum* L. (SNL) glycoprotein, 150-kDa] isolated from *Solanum nigrum*, which has been used as an antipyretic and anticancer agent in folk medicine (Sei-Jung et al., 2006). The antioxidant and cytotoxic effects of a glycoprotein isolated from *S.nigrum* (SNL glycoprotein) were studied with MCF-7 cells (Lee et al., 2006). *Solanum nigrum* (SN) is an herbal plant that has been used as hepatoprotective and anti-inflammation agent in Chinese medicine. The protective effects of water extract of SN (SNE) against liver damage were evaluated in carbon tetrachloride (CCl4)-induced chronic hepatotoxicity in rats (Lin et al., 2008). The plant is found to reduce the production of ROS very significantly (Lidia et al., 2002).

Solanum nigrum (Solanaceae) grows as a weed all over dry parts of India. The juice of the fresh herb is sometimes used for fever and to allay pain. The fruit is used as a cosmetic as rubbing the seeds on the cheeks remove freckles. Children extensively eat the mature fruit. The fruit has been used for diabetes. It has been used in early Ayurveda along with other ingredients in heart disease. It was also stated that the berries of this plant could be eaten without danger. It appears to have been used chiefly by the Greeks

as a local application to inflamed parts (Manjunatha, et. al., 2004). The root is carminative, expectorant, useful in asthma, cough, toothache, worm complaints, fresh leaf juice mixed with ginger is taken to stop vomiting (Chopra, et al., 1956). Roots are also used in cardiac disease, giddiness, kidney stones, liver disorders, tuberculosis (Keshava Murthy, 1994). The tribal groups residing in the Western Ghat's use the plants as a potent anti anemic drug (A decoction of the fresh plant mixed with a tea spoon full of honey is given to pregnant woman and anemic patients to increase the blood/hemoglobin). Review of the literature revealed that though the plant is used as potent anti anemic plant by the tribal groups, no clinical studies have been done to test its efficacy in improving the antioxidant and hemoglobin content. The antioxidant properties have been studied on a number of other plants too.

Antioxidants

Antioxidants are intimately involved in the prevention of cellular damage - the common pathway for cancer, aging, and a variety of diseases. The scientific community has begun to unveil some of the mysteries surrounding this topic, and the media has begun whetting our thirst for knowledge. Athletes have a keen interest because of health concerns and the prospect of enhanced performance and/or recovery from exercise. Free radicals are atoms or groups of atoms with an odd (unpaired) number of electrons and can be formed when oxygen interacts with certain molecules. Once formed these highly reactive radicals can start a chain reaction, like dominoes. Their chief danger comes from the damage they can do when they react with important cellular components such as DNA, or the cell membrane. Cells may function poorly or die if this occurs. To prevent free radical damage the body has a defense system of *antioxidants.*

Antioxidants are molecules which can safely interact with free radicals and terminate the chain reaction before vital molecules are damaged. Although there are several enzyme systems within the body that scavenge free radicals, the principle micronutrient (vitamin) antioxidants are vitamin E, beta-carotene, and vitamin C. Additionally, selenium, a trace metal that is required for proper function of one of the

body's antioxidant enzyme systems, is sometimes included in this category. The body cannot manufacture these micronutrients so they must be supplied in the diet.

Vitamin E : It is alpha tocopherol-fat soluble vitamin present in nuts, seeds, vegetable and fish oils, whole grains (esp. wheat germ), fortified cereals, and apricots. Current recommended daily allowance (RDA) is 15 IU per day for men and 12 IU per day for women.

Vitamin C: Ascorbic acid is a water soluble vitamin present in citrus fruits and juices, green peppers, cabbage, spinach, broccoli, kale, cantaloupe, kiwi, and strawberries. The RDA is 60 mg per day. Intake above 2000 mg may be associated with adverse side effects in some individuals.

Beta-carotene is a precursor to vitamin A (retinol) and is present in liver, egg yolk, milk, butter, spinach, carrots, squash, broccoli, yams, tomato, cantaloupe, peaches, and grains. Because beta-carotene is converted to vitamin A by the body there is no set requirement. Instead the RDA is expressed as retinol equivalents (RE), to clarify the relationship. (NOTE: Vitamin A has no antioxidant properties and can be quite toxic when taken in excess.)

Endurance exercise can increase oxygen utilization from 10 to 20 times over the resting state. This greatly increases the generation of free radicals, prompting concern about enhanced damage to muscles and other tissues. Because it is not possible to directly measure free radicals in the body, scientists have approached this question by measuring the by-products that result from free radical reactions. If the generation of free radicals exceeds the antioxidant defenses then one would expect to see more of these by-products. These measurements have been performed in athletes under a variety of conditions.

Several interesting concepts have emerged from these types of experimental studies. Regular physical exercise enhances the antioxidant defense system and protects against exercise induced free radical damage. These changes occur slowly over time and appear to parallel other adaptations to exercise.

On the other hand, intense exercise in untrained individuals overwhelms defenses resulting in increased free radical damage. Thus, the "weekend warrior" who is predominantly sedentary during the week but engages in vigorous bouts of exercise during the weekend may be doing more harm than good. To this end there are many factors which may determine whether exercise induced free radical damage occurs, including degree of conditioning of the athlete, intensity of exercise, and diet.